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**An Evaluation of Effective Structures for Campus Sustainability Programs
At Institutions of Higher Education**

A thesis submitted in partial fulfillment of the requirement
For the degree of Bachelors of Arts in Environmental Policy from
The College of William and Mary

By: Lauren Edmonds

Accepted for _____
(Honors, High Honors, Highest Honors)

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May 6, 2011

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Abstract

The need for sustainability in both the education and operations of colleges and universities has inspired many to launch sustainability programs on their campuses. As institutions of higher education invest in creating and expanding their campus sustainability programs, there is a need to identify the most effective institutional structure for achieving campus sustainability goals.

This comparative study analyzed the sustainability programs at eight colleges and universities. I selected these institutions to be somewhat similar to my own, The College of William and Mary. Personal interviews and in-depth research were conducted to gather detailed information on the structure of each campus' program. This information was used to score the institutions on a series of twenty variables. These variables were then correlated to a measure of the program's success, adapted from their score on the Sustainable Endowments Institute Green Report Card.

Through quantitative and qualitative analyses, the factors most strongly associated with program success were: the amount of funding it received; the reliability of that funding; the program's size; the physical space allocated to the program; and the source of its initiation. The greatest success correlated to large amounts of reliable funding, a large program size, dedicated space for the program, and a bottom-up initiation.

Based on the results of this research, when colleges and universities decide to take up sustainability goals, they need to make serious investments in their sustainability programs while also fostering strong student support. Both institutional investment and grass-roots student support appear crucial for enacting effective sustainability initiatives.

Introduction

Institutions of higher education are hotbeds of potential and possibility. With all of the environmental challenges facing our world, from climate change to species loss, it is clear that colleges and universities need to be a source for sustainable solutions. “Higher education has unique academic freedom and the critical mass and diversity of skills to develop new ideas, to comment on society and its challenges, and to engage in bold experimentation in sustainable living” (Cortese 17). The need for sustainability in both the education and operations of colleges and universities has inspired many to launch sustainability programs on their campuses (Matson).

Here, I use the term “program” inclusively, as to encompass sustainability initiatives of every shape and size. Some schools have chosen to establish an office to coordinate and lead their sustainability efforts. Other schools dedicate one staff position to the sustainability projects on campus. On some campuses, sustainability is still an afterthought, a responsibility added on to existing positions. These programs vary widely in structure and also in outcomes.

A select number of colleges and universities have made significant commitments to sustainability and define their campus character in terms of environmentalism. Well-known examples include Middlebury College in Vermont, or Oberlin College in Ohio. These institutions consistently rank among the best sustainability programs in the country. Other colleges and universities have seen significant improvements in external ratings of their sustainability programs. My home institution of William and Mary has improved greatly in the past four years. Schools remain, however, that have not made progress on sustainability measures, whether by lack of ability or lack of interest. For institutions that are attempting to make the transition to a more sustainable campus, their program design is likely an important part of that transition. With most campuses facing increasing limitations on their resources alongside increasing expectations of sustainability, it is necessary to find the most effective routes to improved sustainability.

My research focuses on the structure of campus sustainability programs, and how the different structures are associated with the different sustainability outcomes.

I was drawn into the study of sustainability in higher education after my own involvement in the development of sustainability initiatives on our campus. I have been able to see the structures put into place at The College of William and Mary and I have been a part of the discussions of how those structures might evolve. Because of this personal motivation, I hope that my research will not only contribute to the broader field of campus sustainability, but that it will also inform institutional decisions within my own community.

Sustainability in Higher Education

As of 2007, there were more than four thousand institutions of higher education in the United States; these institutions enrolled more than eighteen million students and employed more than one million faculty members (U.S. Census Bureau, 2011). Colleges and universities have an

enormous immediate environmental impact simply from their institutional size and population. Operating an institution of higher education demands high resource use, from the water used in student dorms to the electricity to keep the lights on in classrooms. Reducing this high environmental impact is often the primary concern of campus sustainability programs.

Beyond this immediate impact, institutions of higher education influence the way their graduates live the rest of their lives. As one campus sustainability leader told me about Clemson University's sustainability goals, "It's probably more important to change the culture of the students in the long run, of all the students who graduate, than it is for Clemson University to be carbon neutral because our students go out and change the world," (B. Sill, personal interview). The influence of colleges and universities extends far beyond their campuses through the values they teach their graduates. Sustainability is a perfect example of how students can learn outside of the classroom. Perhaps the idea has been best articulated by David Orr: "Students are taught in various and subtle ways beyond the content of courses" (Orr 55 in *In Context*). The concept echoes through much of the published sustainability research (Bacow and Moomaw 39; Thompson and Creighton 42; Pittman 200; Rohwedder 293). The way in which the institution conducts its business and teaches its students instills them with the lessons to become the leaders of tomorrow.

For these reasons, the environmental sustainability of colleges and universities has become a major focus of both higher education research and operations. Campus sustainability has been gaining traction as the prevailing trend in higher education. If it is to become more than a trend, however, colleges and universities need to successfully institutionalize their sustainability efforts.

Colleges and universities have made a range of commitments to sustainability, from sector-wide declarations like the American College and University Presidents' Climate Commitment to institution-specific sustainability policies. Typically, the president or the board of the college commits the campus to sustainability practices and goals. The implementation then falls to other members of the campus community. The difference arises with how campuses institutionalize their sustainability policies.

As with all research in sustainability, my work would contribute little to the world if it were to remain abstract theory. Once I identified the institutional structures most strongly associated with positive sustainability outcomes, I applied this model to The College of William and Mary to produce useful policy recommendations.

Sustainability at the College of William and Mary

The College of William and Mary has had an institutional sustainability program since the fall of 2008. Sustainability had been a strong presence on campus before that time, of course, but it has only been in the past three years that the school has committed funding and personnel to the initiative. As the program has evolved, there has been a grassroots effort to establish a more effective structure that can sustain the progress the school has achieved to date. As a public

school with few resources, however, the institution has limited funding available for sustainability, and if a structure is established it will be important for that structure to be as efficient as possible in accomplishing The College's sustainability goals.

Goals

My research aims to identify the institutional structures most strongly associated with positive campus sustainability outcomes in order to recommend feasible, sustainable solutions to The College of William and Mary.

I embarked upon a comparative analysis of sustainability programs of colleges and universities considered peers to The College of William and Mary. With the information I gathered through personal interviews, I was able to catalog the elements of each school's sustainability programs and identify which elements appeared to make the greatest contribution to the outcomes seen on their campuses.

Literature Review

A Brief History of Campus Sustainability

In general, sustainability on campuses has evolved over three time periods which concentrated on different aspects of the issue: environmental education, campus operations, and campus sustainability. In the first period, colleges and universities focused on environmental education. They introduced students to environmental problems and analyzed the practices of others. The vast majority, however, made no move to consider their practices in relation to the environment. The oil crises of the 1970s were the impetus for the transition to thinking about campus operations. Institutions confronted the limits to their resource use and began prioritizing efficiency. It was not until the 1990s that higher education began to see campus sustainability as a merging of their educational mission and their growing self-awareness.

In many ways, the evolution of campus sustainability as a field reflects the development of the three scopes that programs inhabit (academic, facilities, and senior administration). Some programs are firmly grounded in the academic sphere of campus and focus fairly exclusively on environmental education. Programs that grew out of a focus on campus operations are based in Facilities Services and generally concentrate on improving efficiency in operations. Programs with the largest scope, reporting to upper administration and with a perspective on the entire campus, integrate students' classroom experiences with the functions of the institution to move toward a broad view of campus sustainability.

Environmental Education

Sustainability arrived on campuses in the form of environmental education. Environmental education got its start in the 1960s and continued reaching various campuses through the 1970s, much like the influence of the environment on all facets of American life. Describing the atmosphere of the late 1960s, Edward Weidner and William Kuepper wrote, "The environmental

movement was riding high, and UWGB was riding high with it,” in their case study of environmental education at the University of Wisconsin – Green Bay (Weidner and Kuepper 28). The University of Wisconsin – Green Bay was part of the early movement to open environmental education programs. As the movement spread, it became a topic for collaboration across campuses and countries.

In 1974, institutions came together for the Conference on Environmental Education at Post-Secondary Level in Denmark. Weidner opened the conference with a call to action: “This is the kind of world which higher education must address in the last quarter of the twentieth century. It is a restless world. It is a world demanding action now. It is not a world that can wait... If universities are to assume a more vital role in society, they cannot afford to wait either... Education, and university education in particular, must become environmental in the broadest sense of that term,” (Weidner 17). Embracing environmental education served two purposes in higher education. On a moral level, studying the environment contributes to colleges and universities’ educational mission and upholds their responsibility to society. From a more grounded perspective, integrating environmental issues into their curriculum ensured that colleges and universities would maintain and augment their position in society. This motivation was particularly common in the United States; environmental issues were seen as an opportunity for institutions of higher education to lead society. Drawing from a speech by Alvin C. Eurich in 1979, Gary Schiff argued that “American colleges and universities have historically been reactive or responsive to major changes in society and have not been in the forefront of directing, stimulating, designing, or implementing those changes” (Schiff 65). Educating students about the environment was the opportunity to change that.

At this time, the focus was primarily on integrating environmental problems into curricula at colleges and universities. The connection between the environmental problems and their own practices went unconsidered. Higher education had not yet developed a reflective perspective in its operations or its instruction.

Efficiency in Operations

The oil crises of the 1970s spurred colleges and universities to begin addressing their resource use. The New Directions for Higher Education series explored the shift to operational awareness in 1981 with *New Approaches to Energy Conservation*. As Sidney G. Tickton observed in his editor’s note to the volume, “Energy conservation has quickly become a high priority item, and the colleges and universities that have used conservation on their campuses have cut energy use significantly in return for time, money, and energy spent,” (Tickton vii). While environmental concern was not the inspiration for their work, the concern over energy and other resource use certainly had environmental benefits. Beyond the operational changes that arose in this period, higher education laid the framework for deeper work in campus sustainability. Critical thinking about energy use on campuses led to greater categorization in the field. For example, Horace J. Bomar and Arthur F. Hirsch identified the divide between the factors under the institution’s internal control and external factors such as weather, energy availability, or legislation (Bomar and Hirsch 3). Within the scope of what campuses could influence, Bomar and Hirsch considered

the distribution systems of energy on campus as well as the end use of energy. The end use could be influenced and improved primarily through technological change, but also through behavioral change. While they focused on ways to improve energy management, Bomar and Hirsch and the others like them at campuses across the country made the future sustainability-based research on campus systems possible.

As campuses looked more closely at their resource use and infrastructure, the environmental implications of their operation became apparent. Suggestions of the links between campus operations, the environment, and students' education began developing; "Added to the pressing financial demands of energy issues, the overwhelming environmental consequences of campus energy use are coming under the scrutiny of the academic community, not only to address personal concern of members of the institutional community but also to incorporate the campuses into environmental curricula as ready-made laboratory exercises" (Pierce 31). This budding connection between operations and the classroom improved efforts for conservation as well (Pierce 42). An academic perspective brought greater oversight and monitoring to energy conservation programs, making their evaluation more reliable (Pierce 42).

Campus Sustainability

In the early 1990s, an observable shift toward an integration of environmental education and campus operations occurred. Before that point, David Orr found that "campus resource flows were regarded as technical matters of institutional management, not problems of moral or even pedagogical concern," (Orr 5 in *The Campus and Env'tal Responsibility*). Universities frequently studied the environmental impacts of others, but they rarely turned this analysis onto themselves (Creighton and Cortese 22; Eagan 66).

By 1992, however, David Eagan noted that "campus environmentalism is starting to alter perceptions about what higher education is for, what is worth learning, and what graduates ought to understand and do about environmental concerns... for colleges and universities to realize this educational potential, they need to better recognize their essential role in fostering this kind of grounded learning" (Eagan 75). This transformation began the era of campus sustainability in the United States.

As Tarah Wright detailed, "Universities in the 1990s found themselves in a world of environmental concerns. Universities were looked upon by society as institutions that could seek knowledge and truth, and apply such knowledge to solve the complex problems of society. At the same time, universities were being criticized for their inability to be models of sustainability both in greening their operations and in developing environmentally friendly curriculum" (Wright 9).

For many in the field of campus sustainability, the catalyzing moment for their work was David Orr's 1990 Commencement Address at Arkansas College, now Lyons College. This speech has since been adapted into multiple articles (Orr 1991, Orr 1992). In it, Orr questioned the purpose of an education that lacked any environmental awareness component. "When the actions of

educated people ‘ruin the world,’ for whatever cause, it is time to ask what went wrong in their education,” he proclaimed (Orr 4 in *The Campus and Environmental Responsibility*). Orr called for colleges and universities “capable of embodying ideals wholly and completely in all of their operations” (Orr 56 in *In Context*).

Incorporating campus sustainability into a college or university’s academics had obvious advantages for the institution. The entire campus could become a laboratory for students to have firsthand experience working with environmental issues (Orr 6 in *The Campus and Environmental Responsibility*; Creighton and Cortese 29). This experience better prepared students for dealing with environmental issues in a broader context by giving them a familiar place to start (Smith and Gottlieb 9; Pierce 43).

Leaders in campus sustainability emphasized that learning was not limited to the classroom and educators could not treat it as if it were. The way universities operated, the way they were constructed, the way they managed their own environmental responsibilities, among a myriad of other actions, imparted lessons to students about their relationship with the environment (Orr 56 in *The Learning Revolution*; Cohen 90; Rohwedder 293). “Both the design and operation of the university facilities clearly teach us how the ‘most educated people’ build and run the places in which they live and work... [They] pay far too little attention to their consumption of energy, their generation of waste, of the related impacts these behavioral patterns have on future generations or other living things” (Rohwedder 297). University operations became an opportunity to demonstrate the principles of sustainability in action (Bacow and Moomaw 39; Pittman 200).

Higher education was not expected to take on the task of greening their campuses simply for the rather vague educational benefit, either. As with energy management, there were financial advantages to an effective campus sustainability program, largely through increased efficiency and the resulting decrease in operating costs. The positive influence on the local economy supported a stronger region that could then better serve the institution, as well (Orr 5 in *The Campus and Environmental Responsibility*). By operating sustainably, colleges and universities ensure their continued existence (Merkel and Litten 15).

Lawrence Bacow and William Moomaw summarized the three reasons an organization would act to prevent environmental problems as economics, ethics, and mission (Bacow and Moomaw 38). In addition to the efficiency gains that came with sustainability, they also recognized the benefit of anticipating future liabilities should laws change and reacting early. The ethical motivation drew upon the need to do less harm to others. From their perspective, an organization could include reducing its environmental impact within its mission.

Campus Sustainability Today

Characteristics of Successful Campus Sustainability Programs

James Pittman identified five elements as “integral to success in organizational change for sustainability.” institutional commitment, a shared vision of the future, sustainability indicator

reporting, participatory management structures, and external partnerships (Pittman 209). Christopher Crittenden and Teresa Burnau made similar observations related to energy management programs. They identified five characteristics of successful energy management strategies: commitment from upper administration, a specific and recognized policy, usable data to prioritize and evaluate efforts, continuous evaluation, and one individual is responsible for the overall plan while involving the rest of campus (Crittenden and Burnau 39).

Sustainability Commitments in Higher Education

Tufts University was the first to make a public commitment to a sustainability initiative. In 1990, the university president took on the public goal of having all graduates be environmentally literate (Creighton and Cortese 19). President Jean Mayer established environmental education and protection as priorities for Tufts that year, making it the first of major universities to do so (Creighton and Cortese 19). The University of Georgia was also among the earliest campuses with an official commitment to campus sustainability (Eagan 74).

Declarations from multiple institutions of higher education became a popular way for campuses to make a commitment to sustainability. The key themes of these declarations were constant over time (Wright 17), from the earliest statements on environmental education in the 1970s to the more recent declarations focused on sustainability. The declarations recognized the moral obligation that institutions of higher education had to increase their sustainability and the research they provided to the public (Wright 13).

Cross-Campus Collaboration

Sustainability has become an important avenue for cooperation between colleges and universities. Because the challenges affect them all, and in many cases they have adopted identical commitments, institutions have much to gain by sharing strategies. While sustainability practitioners do need to acknowledge campus-specific limitations, the majority of campus sustainability strategies are highly transferable.

Brown University opened an electronic mailing list in 1992 to facilitate the sharing of information across campuses (Corless and Ward 52). Their sustainability staff pursued networking and collaboration opportunities through many outlets, even academic publications; in *The Campus and Env'tal Responsibility* the chapter by Brown staff, they issued a call for networking opportunities and publicized the mailing list.

State-level and regional conferences also provided schools the opportunity to share strategies and information. Campus pollution prevention was an early focus, as was campus recycling (Eagan 75).

The Association for the Advancement of Sustainability in Higher Education (AASHE) formed in 2006 to serve as a resource and to enable greater collaboration on sustainability. The organization hosts an annual conference with a strong focus on sharing best practices and promoting successful sustainability initiatives.

Establishment of Campus Sustainability Programs

According to a recent study, the primary determinants of whether or not a campus decided to adopt a sustainability program were the institution's size and wealth (Stafford 1). A large student population enables a campus to achieve economies of scale and creates more opportunity for environmental interaction to occur (Stafford 11). Wealth was measured by multiple variables, including the endowment and tuition, and indicates that schools with greater resources available to them for any initiatives will put more resources into sustainability programs than school without similar levels of wealth (Stafford). The stakeholder involvement from faculty, alumni, and the surrounding community also affected a campus' decision (Stafford 1). Overall, this suggests that structures are more likely to exist when they can be well-supported with financial resources and campus involvement.

Structure of Campus Programs

Because of their older origins, energy management programs offer organizational lessons for broader campus sustainability. "Successful energy management programs have definite characteristics. One person is charged with the responsibility of being the energy manager on campus. This individual disseminates information to the community and, most importantly, provides the long-term planning and guidance required of all energy management programs. Without this guidance and direction all programs are doomed to failure" (Crittenden and Burnau 38).

A few key similarities arise when discussing successful structures for campus sustainability programs. The need for collaboration from all levels of campus is enormous (Pittman 200; Bomar 9). "These synergistic relationships [between students and administrators] can broaden the scope and elevate the efficacy of sustainable environmental projects... Yet, student-based initiatives are not without their shortcomings. Limited by their two- or four-years stays on campus, students are often rendered powerless when it comes to shaping campus policy. Thus, they gravitate toward projects that offer short-term results. Administrators are needed to infuse the programs with elements of long-range planning" (Keniry and Trelstad 110). Program design and structure must enable the involvement of the students, faculty, staff, and administration for a program to thrive.

Methodology

Research Questions and Methods Summary

The goal of my research was to identify the institutional structures most strongly associated with positive campus sustainability outcomes in order to recommend feasible, sustainable solutions to The College of William and Mary. To accomplish this goal, I needed to answer the question: What institutional structures have been associated with the most successful campus sustainability programs?

The structure can be described not only as the categorization of the program (a committee, an office, etc) but also as a product of the program's size and scope. To determine the structure of sustainability programs in institutions of higher education, I conducted interviews with selected schools and then compared the data I collected to the scores the institution received from an independent sustainability assessment by the Sustainable Endowments Institute.

There was the possibility that the institutional makeup of colleges and universities would be too complex for the structural components that contribute to success to be identifiable. As Malcolm Tight found, "studies of the internal make-up of universities... reveal just how diverse, and structurally unstable, these institutions are. Indeed, each university has its own distinct identity, with no two identical" (Tight 143). The prevalence of research on institutions of higher education, however, suggests that despite their complexity colleges and universities are as viable a subject as any. The data analysis could be expected to generate usable policy recommendations.

Research Approach

An accepted approach for campus sustainability research is through comparative case studies (Walker, et al. 230, Tight 185). Case studies are frequently used to thoroughly study a campus' institutions for any issue area; "Externally, the evaluator may compare institutions in an effort to identify practices that work and those that do not. This work is particularly valuable for those attempting reform in their own institutions" (Walker, et al. 230). The comparative analysis of the studies is integral to the research in order to provide perspective on the information collected for the separate institutions.

Some researchers have questioned the value of purely comparative analyses and have argued in favor of incorporating absolute measures of sustainability (Shriberg 72). While it is true that institutions should be mindful of their absolute, rather than merely relative, impact on the environment, the ideal for sustainability in higher education has certainly not yet been achieved and in many ways has not been defined. Until the field of campus sustainability develops further, comparative analysis among institutions is the most practical and meaningful methodology.

In his discussion of higher education research, Malcolm Tight identified eight key themes; sustainability in higher education spans five of the eight themes and my research on the subject focuses on two: "system policy" and "institutional management" (Tight 7). Both are considered at the specific level of the college or university, not narrowed to individual level analysis nor broadened to system-wide or national level analysis (Tight 11).

Case Selection

For this research eleven campuses were chosen for study, though only eight were ultimately analyzed.

The cases were chosen with the specific goal of providing useful policy recommendations to The College of William and Mary. Appropriate comparisons are integral to identifying structures and policies that occur in one institution but that could be effectively emulated elsewhere (Tight 190). To offer cases relevant to The College, I began with the entire list of peer institutions identified by the Provost's Office and the list of public colleges and universities in Virginia. Thirty-seven schools appeared on this original list.

I then narrowed this list by several criteria to ensure that any successful structures identified would be transferable to the College.

Only schools in rural or suburban areas were considered. William and Mary is located in Williamsburg, Virginia, a city with a population of under 12,000 residents which lacks the infrastructure available to a larger, urban area that could support The College's sustainability efforts. This difference is most notable in mass transportation systems. Schools in metropolitan areas such as New York City are able to utilize public transportation much more easily. The difference may also be seen in areas such as food sustainability; rural or suburban campuses may have greater access to local food networks. Overall, the variation in settings had the potential to affect a campus' options for sustainability efforts in ways outside the focus of this study.

The student population and endowment are important factors in the operation of the institution. The student population is indicative of the college or university's overall size. Larger institutions typically have greater resources available because of their scale. An institution's endowment is representative of its financial situation. Overall, the endowment is only one source of income for a school; funding should be available from the endowment, debt financing, fundraising, and net tuition revenue (Rodas). But of these, the endowment provides the most reliable description of funds from year-to-year.

An institution's characterization as either public or private was unimportant in case selection. The distinction between the two is becoming increasingly blurred, particularly for William and Mary. In 2008, the President of the College and the Chair of the College's Foundation wrote, "For all practical purposes, William and Mary has become a privately supported university that also receives some state assistance" (Reveley and Schroeder 2008). Declining public support for higher education has forced many public institutions to move toward a funding model more similar to private colleges and universities. So it was to be expected that the title of public or private will not have a significant effect on an institutions' operations.

The final element in case selection was ensuring variation in structures and outcomes. Evaluating schools with only one form of program would fail to highlight the differences possible in the structure of sustainability institutions. If all of the schools chosen had successful programs, it would be impossible to correlate any structure with poorly ranked outcomes.

Through this process, ten colleges and universities, in addition to William and Mary, were selected for the comparative analysis.

1. Brandeis University
2. Clemson University
3. Rutgers University
4. University of California – Irvine
5. University of California – Santa Barbara
6. University of Georgia
7. University of New Hampshire
8. Wake Forest University
9. The College of William and Mary
10. Virginia Military Institute
11. Virginia Polytechnic Institute and University

As research progressed, the University of California campuses in Irvine and Santa Barbara were excluded from the study because they did not receive scores for the Sustainable Endowments Institute Green Report Card, which was ultimately used to measure success of programs. The University of Georgia was unavailable for the data collection interview and was also excluded from the analysis.

Data Collection

Because campus sustainability research is relatively new, little raw data is available for comparative analyses. Information released publicly is either synthesized in independent reviews of institutional practices or selectively released by the institutions themselves. There is currently no sector-wide system for reporting sustainability data at the level necessary for a comparative analysis¹. Most campuses have yet to incorporate sustainability measures into the data they collect through their institutional research offices (Litten and Terkla 3). These circumstances make personal interviews the most practical method to gather specific sustainability data from colleges and universities.

After personal interviews were conducted to collect specific information on institutions' sustainability practices, further information could be obtained from both their official publications and websites and from data publicly released by the Sustainable Endowments Institute.

Interview Process

Personal interviews are the most valid method of gathering data related to campus sustainability for comparisons among institutions of higher education (Tight 193). There are drawbacks to interview-based research, time inefficiency prime among them, but this has not dissuaded many researchers from taking this route to data collection (Tight 193).

¹ The Sustainability Tracking Assessment and Rating System (STARS) developed by the Association for the Advancement of Sustainability in Higher Education may prove to fill the need for a recognized sustainability data collection system but at the time of this research too few schools had reported their information.

The sustainability program for each college and university selected was first contacted via email. The email was sent to the primary contact associated with sustainability on the institution's website. In some cases, the interview solicitation was sent to a program-specific address, others provided personal staff or faculty addresses as sustainability contacts. After I made contact with a representative, arrangements were made for a telephone interview.

The telephone interview consisted of fifteen questions regarding the sustainability at the institution. The general list of questions is provided in Appendix I.

The conversation was conducted using a web-based conference call system which enabled me to record interviews for transcription afterward.

The University of New Hampshire was the only institution to deny my request for an interview. The University of New Hampshire released a book detailing its program in 2009, however: *The Sustainable Learning Community*. Instead of conducting a personal interview, I used the same questions but used their book and website for the information. Throughout this report, I use the term interview but include this research as well.

Further Research

After the telephone interview was conducted, I did any necessary follow-up research using information publicly available either on the institution's webpage or published by the Sustainable Endowments Institute. This research was largely to provide greater detail to concepts discussed in the interviews.

Data Analysis

After conducting the interviews, I identified twenty variables related to campuses' sustainability programs. Some variables had numeric values, such as the school's endowment; others I assigned ordinal values on defined scales. I measured outcomes using a modification of the Sustainable Endowments Institute's (SEI) Green Report Card score.

Variable Identification

The basic variables for comparison were the institution's **endowment**, its distinction as either a **public or private** school, and its **enrollment**.

Two groupings of variables measured the support and involvement from various sectors of campus. First, I considered the level at which the sustainability program was initiated. Some efforts had a primarily grassroots support for beginning a campus sustainability program. Others were instigated by members of the upper administration. Recognizing that some campuses experience a call for sustainability from all levels of the campus, these two variables were independent of one another. The ordinal scores were categorized as **bottom-up initiation** and **top-down initiation**.

The bottom-up initiation variable can be a key measure of the support for sustainability programs on campus. Even when paid positions exist to implement sustainability goals,

programs rely heavily on community acceptance and volunteer support to succeed. Overall, having bottom-up initiation and support provides a project with diverse areas of expertise and experience, which increase the opportunities for collaboration and innovation (Creighton 281).

Analyzing the effect of an administration's initiative or responsiveness in campus sustainability efforts is necessary because research suggests that support from the highest authorities at the college or university is crucial (Corless and Ward 46; Crittenden and Burnau 39;). In his study of energy management programs, Bomar found "Only the well-informed top administrators can rally the community and bring together the various schools, faculty, staff, students, and other decentralized aspects of a campus community in support of and active involvement in an energy management program. It is this official sanction that becomes the foundation of the program" (Bomar 8). The commitment from the administration also provides reliability to the program. Discussing campus recycling efforts, Raymond Ching and Robert Gogan concluded that "if members of a campus community know that they can count on reliable service, they are more eager to take the trouble to set aside materials for recycling in their offices or buildings. Many college and university programs have doubled or tripled tonnages recycled once day-to-day operations are taken over by the administration" (Ching and Gogan 118). The administration's support for these two programs in particular, energy management and recycling, lends credibility to campus sustainability programs as a whole (Thompson and Creighton 50).

I assigned ordinal scores on a scale of zero to three to institutions for their current **staff involvement, faculty involvement, and student involvement**. The structures at each college and university encourage different levels of involvement from these three groups of stakeholders, each which contributes different assets to the sustainability effort. "Collaborative project-based learning among all stakeholders, regardless of their role in a college... is integral to effective sustainability transitions" (Pittman 200).

Describing the campus sustainability initiative at Tufts, Creighton writes "We were struck by the ability of the university community to solve problems creatively when we linked the innovation and theoretical thinking of faculty, the pragmatism of staff, and the energy and idealism of students" (Creighton 281). She continues to detail some of the skills that different community members contribute to sustainability programs. Ultimately, sustainability efforts must encompass the staff, faculty, and students at an institution (Bomar 9). Programs that include high involvement of the staff, faculty, and students will better access the combination of knowledge and skills present on their campus and should expect to see better outcomes than had they ignored valuable stakeholders.

Sustainability efforts must extend throughout the entire college or university staff, largely because the staff will most often be the group implementing the sustainability projects (Bomar 10). The faculty has valuable expertise to contribute to campus programs and organizers behind the sustainability movement should enlist this institutional asset (Bomar 9).

Students are some of the strongest supporters of campus sustainability programs, but they can also be the most unreliable. As Bomar observed, “Students are probably the most transient group and have the most varied interests and concerns. They are also one of the most difficult groups from which to obtain general support, commitment, and understanding” (Bomar 9). Despite these negatives, though, students are the purpose of the university and their needs carry great importance. Michael Shriberg described the “key ‘output’ of higher education” as “educated citizens” (Shriberg 73). This puts students in a unique position as the customer of higher education, giving them greater influence over college and university decisions (Creighton 257).

Beyond an institution’s endowment, other financial factors are important variables. A sustainability program’s access to funding can vary across colleges and universities. The variable of **relative funding** compares the funding amount provided to sustainability efforts on the campus relative to other institutions. Financial resources are obviously important in making implementation of sustainability goals possible, but funding has an indirect importance as well. As the Sustainable Universities Initiative in South Carolina found, “the availability of funding worked to establish credibility” (Jerman, et al. 245). By offering funding, they found that faculty and administrators were more willing to listen to sustainability proposals and often maintained interest for the long term. The **funding reliability**, measures the consistency of funding available. Programs dependent on the institution’s general operating budget may see a regression in funding if the college or university goes through a period of time with limited resources. But programs with sustainability-specific funding, such as an endowment restricted to the program, will have access to funding regardless of the financial state of the larger institution. The existence of a **student fee** may provide a program with additional funding, though student fees for sustainability often have restrictions for their use. Frequently, student fees are dedicated to sustainability projects and programming, rather than operational support. Funding with constraints always means more resources than no funding at all, however. A student fee also provides the credibility mentioned above; a willingness to add a sustainability fee to the cost of tuition and other campus fees demonstrates the value students place on sustainability.

Providing essential information to answer my research questions, the structure of a college or university’s sustainability program was measured in three variables: **physical space**, **scope**, and **program size**. A dedicated physical space for sustainability on campus has a dual impact through the efficiency of sustainability efforts and the cultural norms suggested. A physical space “enacts mission in day-to-day institutional life” and creates a tangible element of the sustainability mission (Fugazzotto 1). By installing sustainability in a physical location, the institution communicates the program’s legitimacy to the rest of campus (Fugazzotto 9). This variable was measured on a scale of zero to three.

The scope of a program has the potential to have an extensive impact on its success level. A scale was created from one to three to describe the scope. Zero indicated the school did not

have a sustainability program, one showed that a school had a facilities-based program, two that it has an academic scope, and three that the scope was within the senior administration.

Institutions of higher educational are decidedly hierarchical and issues like department placement and reporting structure are defining characteristics. When Illinois Wesleyan began implementing sustainability initiatives through its Green Task Force, the co-chairs found that traditional hierarchies translated into sustainability efforts; with only a committee structure behind them the students and staff were reluctant to question faculty's leadership and authority (Jahiel and Harper 53). Giving sustainability efforts a direct link to upper administrators can guarantee the program a degree of legitimacy. The scope of a project impacts the depth of institutional activities it can reach as well. A program based in the Facilities Services side of campus will struggle to impact decision makers in the academic side of campus. Overall institutional policy will remain unchangeable if the sustainability program is confined to an academic influence. Because of the complex workings of institutions of higher education, I expected to find that programs that had structural access to the upper administration would be more successful in implementing sustainability initiatives than those reporting only to academic departments or to Facilities Services. Because the primary work of a college or university is education, it was also expected that a program biased toward an academic structure would have a greater impact than a program limited to Facilities Services.

Program size is simply a relative measure of the positions enveloped in sustainability programs across campuses. Some campuses have chosen to create multiple positions and large offices to lead their sustainability efforts. Others have selected an alternate route of lean administrative structures meant to support volunteer activities. It is unclear whether sustainability is a one size fits all program, or if different campuses will have entirely different needs as regards to program size.

Age was another variable considered important to a sustainability program's success. Some institutions created their programs years ago and have had the time for a trial and error path to success. There have also been more opportunities for those programs to make significant changes to their campuses. Newer programs, on the other hand, may still be finding their place on campus and planning for future initiatives.

Campus policies regarding sustainability were identified by an institution's public commitments or organization memberships. The campus' status as an **AASHE member**, **STARS participant**, or **PCC signatory** was also considered as a variable of an institution's commitment to sustainability and involvement in the larger movement. These programs also all offer resources to campuses intended to improve their sustainability programs. For example, the Association for the Advancement of Sustainability in Higher Education (AASHE) formed in 2006 to specifically serve as a resource and enable greater collaboration on sustainability. The existence of a **climate action plan** or **sustainability action plan** was included as well. These plans are institution-specific and encompass campus policies on sustainability. This is important because early campus sustainability research found that not only do "universities, as a function of their size

and the nature of their activities, have environmental significance but that their policies are critical as well” (Smith and Gottlieb 17). Commitments may be essential to achieving organizational change and providing a shared vision of a campus’ sustainability goals (Pittman 209).

Measuring Variables

The information regarding basic descriptions of the campus (endowment, public or private status, and enrollment) is all available publicly from a variety of sources. I used the endowment data provided by the National Association of College and University Business Officers (NACUBO) – Commonfund Study of Endowments for 2010, with the exception of Virginia Military Institute. Virginia Military Institute was not listed in the NACUBO – Commonfund study but had released their endowment amount for the same year to the Sustainable Endowments Institute. The Sustainable Endowments Institute’s listing of a school as either public or private was also used. The enrollment data was taken from the *Princeton Review* information on colleges and universities.

The remaining variables were measured through the data collection I performed. After conducting the interviews, I used the information I collected to assign scores to each institution for the variables. The ordinal scales are attached as Appendix II.

Measuring Outcomes

To measure outcomes, I chose to use the information produced by the Sustainable Endowments Institute (SEI). The Institute is a nonprofit organization that releases an annual Green Report Card in which they score colleges and universities on a variety of sustainability measures. Each institution receives an overall score represented with a letter grade, but SEI also releases scores for the components of schools’ sustainability programs. SEI’s emphasis on transparency in their data and scorings (unless the information is withheld by the college or university, SEI publishes all survey data collected) makes their data exceptionally useful for campus sustainability research.

Because the presence of an office and sustainability staff members affects an institution’s Green Report Card score, I needed to modify this measure. Using the component scores provided by SEI, I recalculated a sustainability score using their scoring for the non-structural categories only. I also excluded the scores related to the institution’s broader investment procedures.

SEI only provides letter grades for the component scores, but I converted these on a 4.0-scale for the reassessment. Using the scores provided for: climate change and energy, food and recycling, green building, transportation, and student involvement, I created a modified SEI score that was an unweighted average of these scores.

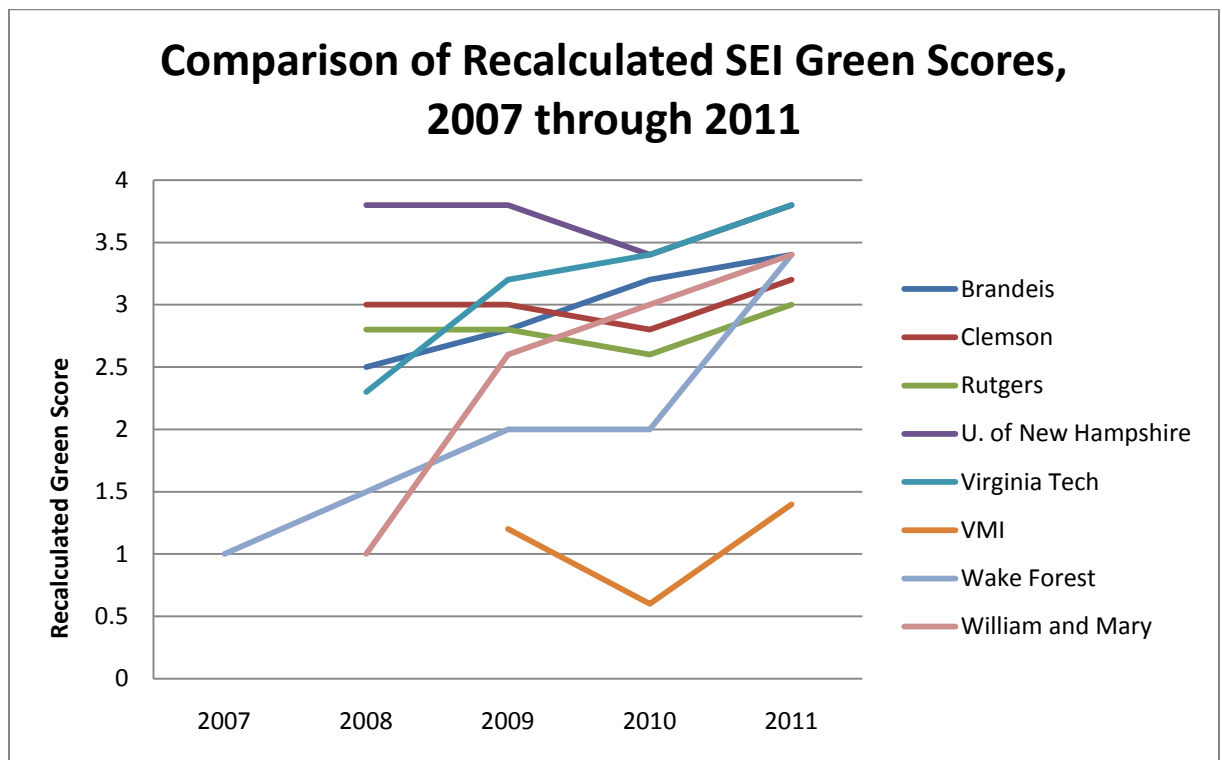
The figure below is an example of the recalculated score for the College of William and Mary.

Year	Climate Change & Energy	Food & Recycling	Green Building	Student Involvement	Transportation	Modified Score	New Grade
2007	n/a	n/a	n/a	n/a	n/a		
2008	0.0	2.0	2.0	n/a	0.0	1.0	D
2009	2.0	3.0	3.0	3.0	2.0	2.6	C+
2010	2.0	3.0	3.0	4.0	3.0	3.0	B
2011	3.0	4.0	3.0	4.0	3.0	3.4	B+

This gave me a measure of sustainability outcomes over time.

Results

From my interviews, I collected information on eight institutions of higher education. I scored the institutions on the twenty variables and used the data to perform a quantitative analysis. Then, I considered the more detailed descriptions from the interviews in a qualitative analysis. From these two perspectives I was able to evaluate the relationships between the variables studied and the recalculated SEI green scores.

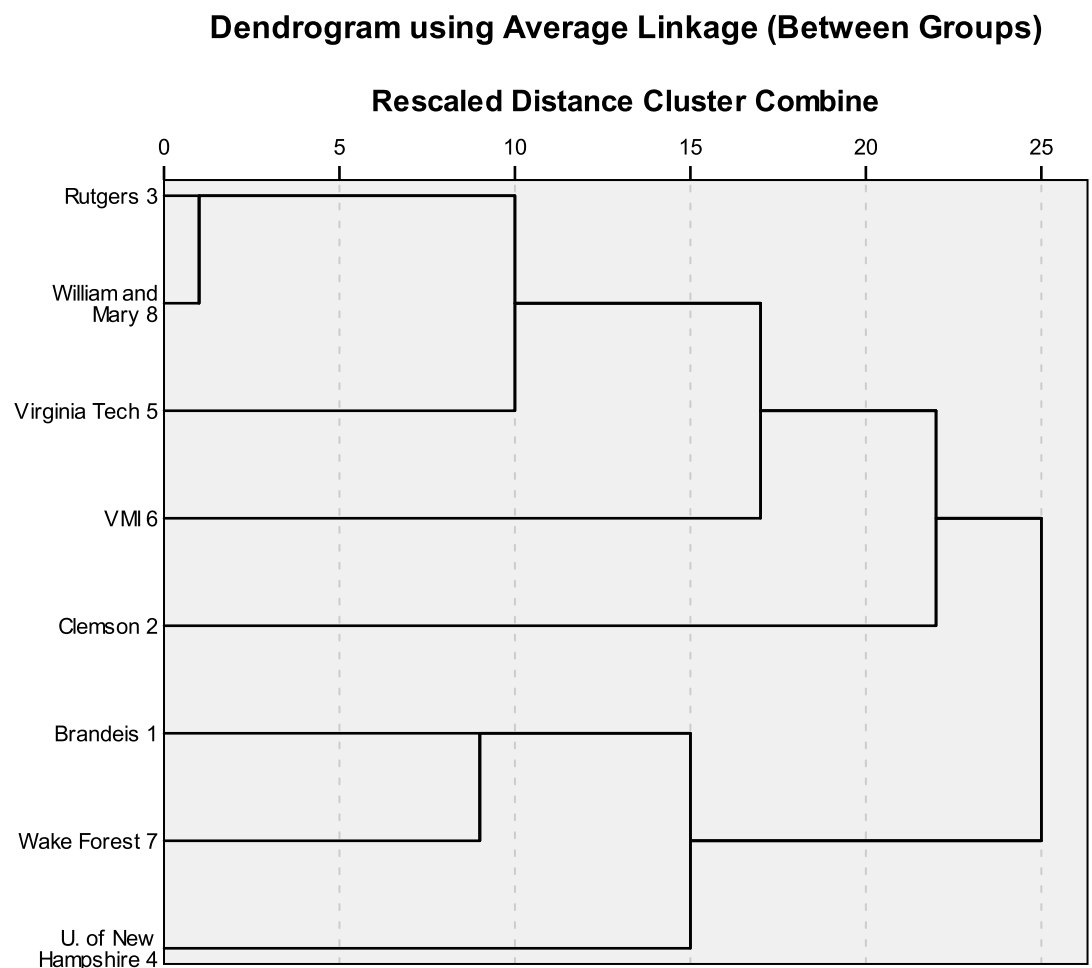


The highest scoring schools were the University of New Hampshire and Virginia Tech. Each received a 3.8 on a 4.0 scale for 2011. Brandeis, William and Mary, and Wake Forest all scored a 3.4 out of 4.0 to be the second-tier of schools.

The university with the second-to-lowest score was Rutgers University, which scored a 3.0. Virginia Military Institute was the school with the lowest score. In 2011, Virginia Military Institute received a 1.4.

The institution with the greatest increase over time was William and Mary, which went from a 1.0 in 2008 to a 3.4 in 2011. Wake Forest also saw a considerable amount of change; the school scored a 1.0 in 2007 and a 3.4 in 2011.

A dendrogram was created to indicate the overall squared Euclidian distances among institutions.



Of the eight schools studied, William and Mary is most similar to Rutgers, and then Virginia Tech. Virginia Military Institute and Clemson University were also included in the same cluster as Rutgers and Virginia Tech. Brandeis, Wake Forest, and University of New Hampshire form a separate cluster.

Quantitative Analysis

A principle components analysis was performed to extract correlated groupings of variables. The results are shown in the table below.

Component Matrix

	Component					
	1	2	3	4	5	6
2010 Endowment	.394	-.620	-.266	.450	.424	.071
Public/Private	.484	-.532	.272	.505	.211	-.327
Enrollment	-.101	.402	-.810	-.140	.189	-.028
Involvement, Staff	.564	-.528	-.156	-.572	-.165	-.112
Involvement, Faculty	.294	.826	.085	-.154	-.126	.403
Involvement, Students	.830	-.182	.459	.213	-.049	.080
Funding, Relative Amount	.939	.122	.278	.019	.108	-.113
Funding, Reliability	.971	.090	-.076	-.083	-.082	.147
Student Fee	.270	-.326	-.001	.438	-.754	.058
Top-down Initiation	-.565	.219	.713	-.075	.338	.044
Bottom-up Initiation	.755	.086	-.570	.099	-.261	.100
Physical Space	.765	-.257	.229	-.438	.272	.151
Scope	.018	.069	.286	.475	.244	.785
Program Size	.806	.305	-.233	-.296	.296	.007
Age	.500	.550	.362	-.516	-.141	.104
AASHE	.555	.284	-.452	.555	.070	.250
STARS	.843	.121	.108	.049	.298	-.385
PCC	.192	.594	.452	.424	-.262	-.218
Climate Action Plan	.268	.793	.072	.298	-.083	-.439
Sustainability Action Plan	-.335	.654	-.303	.306	.322	-.178

Principle Component	Percent of Original Variation Explained
1	35.0%
2	19.9%
3	14.0%
4	12.7%
5	7.94%
6	7.38%

This produced three useful components for analysis; their usefulness was determined by the percentage of variation in outcomes each could explain. The variables included in each component are highlighted in the chart.

After the principle component analysis had produced groupings of the variables, a regression analysis was performed. The principle components were correlated to the recalculated 2011 SEI Green Scores achieved by the schools.

The first component consisted of seven variables: student involvement, relative funding, reliability of funding, a bottom-up initiation of the sustainability program, physical space, the program size, and participation in STARS. This first component explained 51% of the variation in the outcome; as the component increases, the outcomes measured by the recalculated SEI Green Score increase as well. Under closer inspection, some of these variables appear less meaningful than others, though. Student involvement was measured by the original SEI score for later years, so student involvement is simply an endogenous variable and not a significant influence on the actual outcomes. A school's participation in STARS is likely more a factor of the program's size and funding and appears in the first principle component due to that correlation rather than its impact on outcomes. STARS is meant to be a reporting system for institutions, and while four of the case study schools are participating only one has reported so far. Because of this, it is safe to assume that a school's participation in STARS better indicates their funding levels, because of the ability to pay the membership fee, and their program size, because they need someone to gather and submit the data. The first principle component is then treated as being only the variables concerning relative funding, reliability of funding, a bottom-up initiation of the sustainability program, physical space, and the program size.

The second component was composed of the involvement of faculty and the existence of planning documents, specifically a climate action plan or a sustainability action plan. 17% of the variation in outcomes could be explained by this second component. The relationship shows that as faculty involvement increases and the institution commits to more planning documents, the recalculated SEI green score increases. Interestingly, an increase in the involvement of faculty and the number of planning documents correlates to a decrease in the rate of change of the recalculated SEI green score over time, though.

Enrollment and the variables measuring top-down and bottom-up initiation comprised the third component. This third component explains 12% of the variance in the outcomes observed. Higher recalculated SEI green scores are associated with larger enrollments and less emphasis on top-down initiatives.

Qualitative Analysis

Once the most explanatory variables had been identified through the quantitative analysis, I compared these interpretations to the qualitative details I had gathered through the interviews. I observed which schools fit the model suggested by the regression of the recalculated Sustainable Endowments Institute green score with the principle components, and which schools seemed to contradict what was in the quantitative analysis. The overall pattern was reinforced by the qualitative analysis, but there were some interesting exceptions. For example, the scope variable was unimportant to the quantitative analysis but the scope of a program has proved a limitation for sustainability staff members I interviewed.

The more detailed results I gathered are presented below by school, along with the school's sustainability structure and a timeline of their sustainability efforts merged with their

recalculated green score over time. In the organizational charts of the structure, staff positions are indicated with solid outlines and volunteer committees have dashed outlines.

Brandeis University

Brandeis University has seen a steady increase in its recalculated green score, climbing from a 2.5 out of 4.0 in 2008 to a 3.4 in 2011. The Brandeis sustainability program began in 2008 when the sustainability coordinator was hired. In its current form, it is a small office with a facilities-scope.

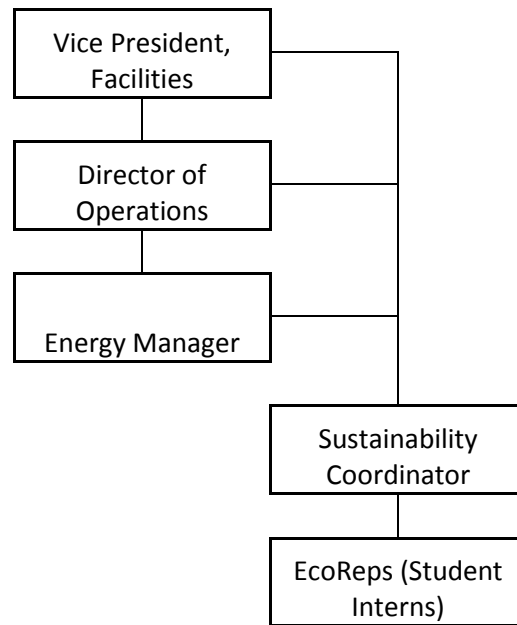
Funding continues to play a significant role in the success of sustainability programs. The Brandeis sustainability initiative is relatively well-funded, though the sources are not completely reliable from year to year. In addition to the sustainability coordinator's salary, there is a communications and materials budget for the program that comes from the institution's general operating fund. The Facilities Services department contributes funding for up to ten student EcoReps, sustainability interns supervised by the Sustainability Coordinator. In 2010, Brandeis students instituted a green fee to create the Sustainability Fund, which is distributed by a committee to fund student projects. A sale of student items donated during move-out provided another small source of funding for the program. In total, the program has funding for its staff and operations, for student internships and projects, and for small budget items like increased recycling. This funding is not guaranteed from year to year but it should be fairly consistent.

It is notable that, while the quantitative analysis suggested an institution's participation in the President's Climate Commitment (PCC) was unrelated to its final recalculated green score, the current sustainability coordinator at Brandeis cited student pressure to sign the PCC and follow through on the commitment was as a major motivator for the creation of her position. This does follow the emphasis on bottom-up initiation seen in the earlier analysis, though, and it could be that student pressure was a driver for the program overall while the PCC was simply the vehicle they used to direct that pressure.

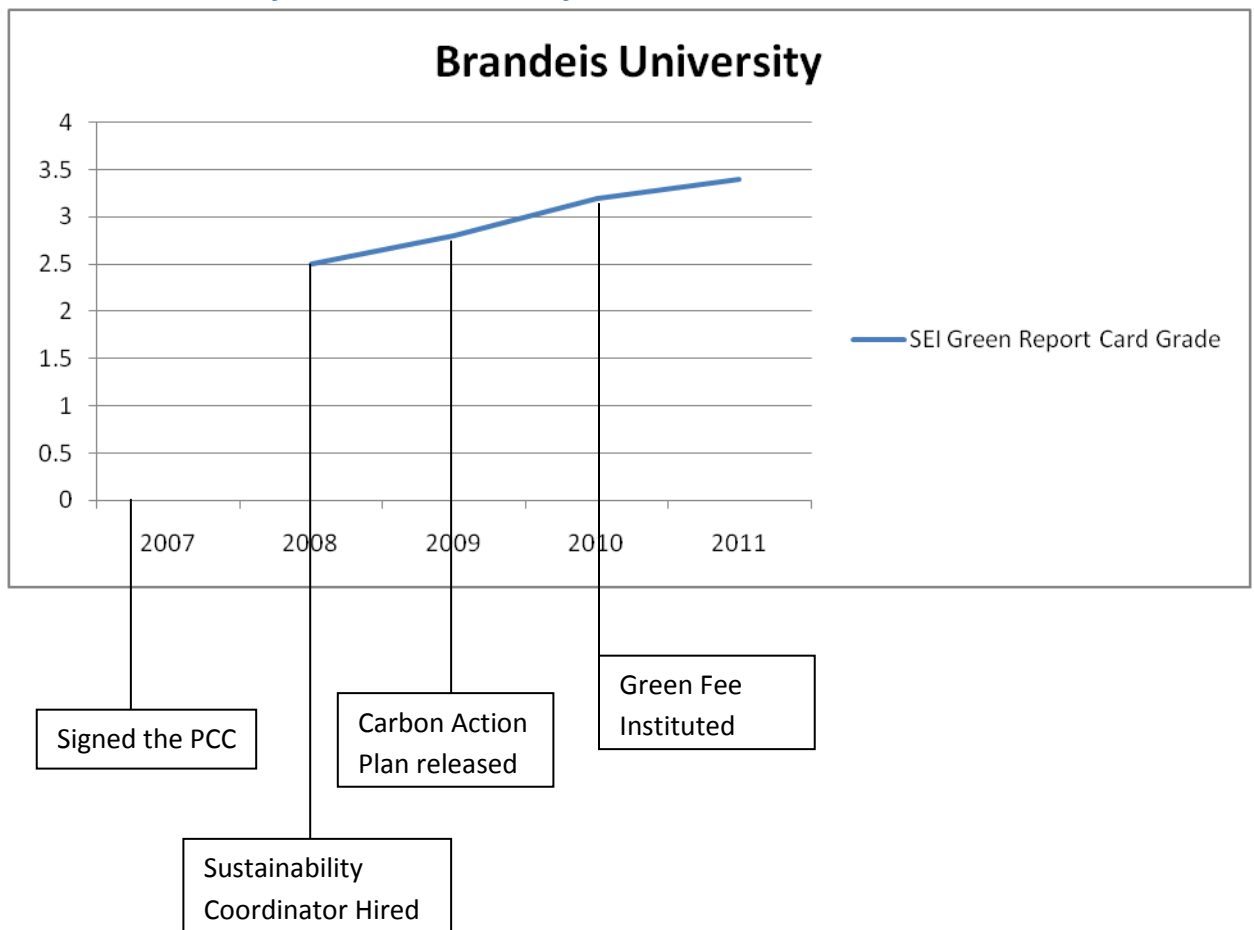
The quantitative analysis also found no correlation between scope of a program and its success. For the Brandeis sustainability coordinator, however, the scope has placed certain constraints on her work. With a facilities-based position, the sustainability coordinator lacks the "institutional pull and support" to influence sustainability in a broader sense, either through academics or faculty and staff initiatives. This creates concern for the future potential of the program; Brandeis has an ambitious climate action plan that the current structure may not have the capacity to implement successfully.

(J. Cohen-Rosenthal, personal interview)

Organizational Structure for Brandeis University



Timeline and Scores for Brandeis University



Clemson University

The Clemson sustainability program is based with the senior administration and has a committee structure. Since the program began, the school has only seen a slight increase in its recalculated green score. In 2008, Clemson scored a 3.0. Then, the President's Commission on Sustainability was created in 2009. Its 2011 score increased to a 3.2, after having declined for a short time.

Clemson's limited progress does appear related to the influential variables identified in the quantitative analysis. The program's funding is both low and unreliable. The Commission can apply for one-time budget requests to fund projects, but most of the money invested in sustainability is through other departments' budgets, such as Facilities Services funding recycling. The sustainability program at Clemson is also small compared to other institutions'. The only official structure is a committee of volunteers; there is no staff member with a responsibility for sustainability in his or her job description. Because the effort is supported entirely by volunteers with other positions on campus, there is no dedicated space for

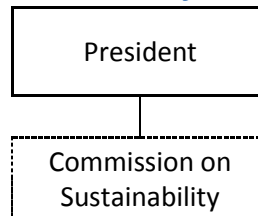
sustainability. Ultimately, because the sustainability structure is a small committee, it depends on other campus units for its existence. Funding, space, and labor are not consistent resources.

Sustainability efforts at Clemson have seen moderate levels of faculty involvement through the commission, but overall the initiative was lead by the upper administration. The President took the first step by signing the President's Climate Commitment, and the upper administration's support has continued through the creation of the Commission on Sustainability. This focus on top-down initiation and relatively low grassroots support is likely responsible for the commission's early emphasis on planning documents rather than project completion.

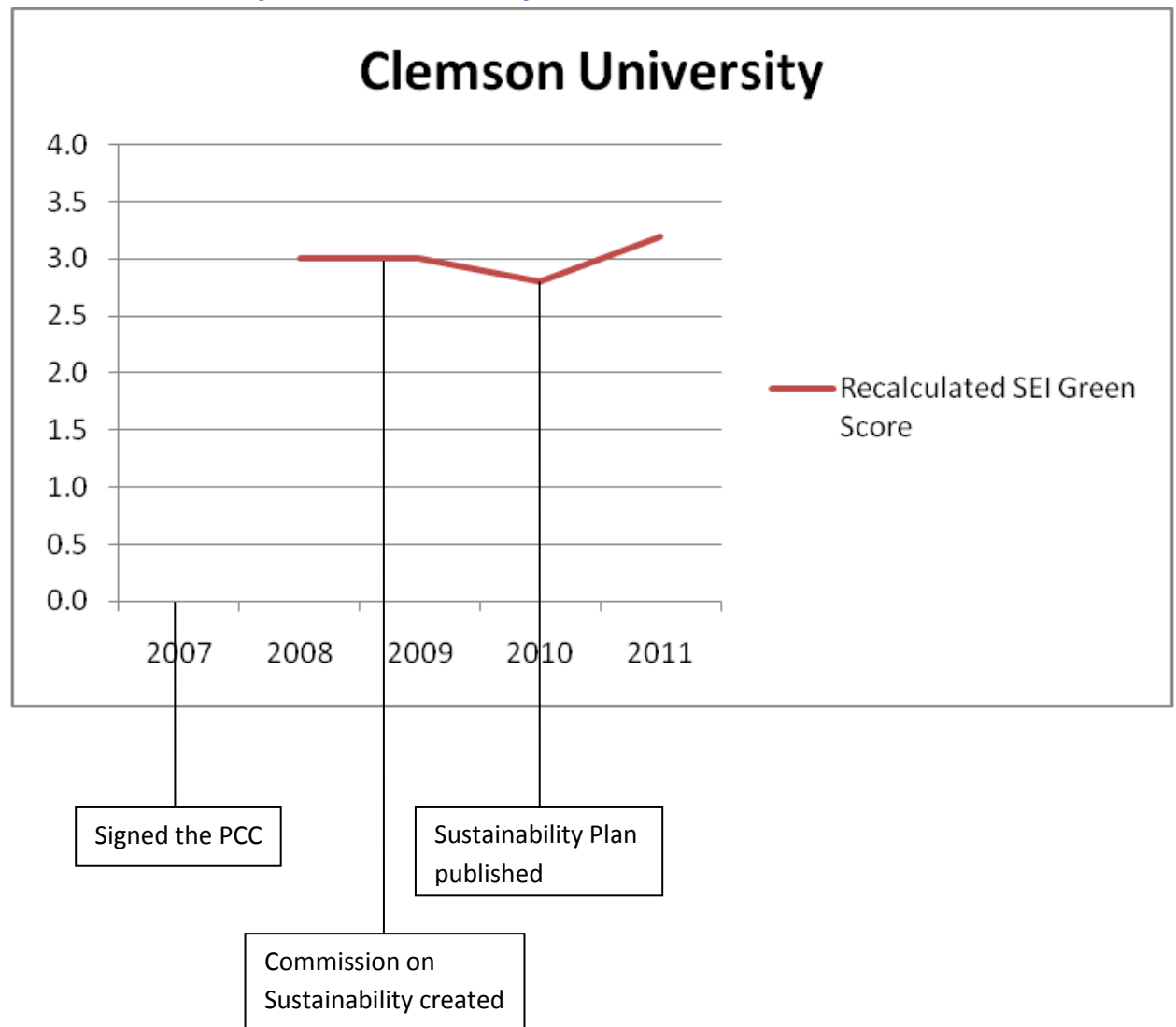
The commission would like to increase the size of the program in the future, if finances permit. Clemson has set an ambitious target of achieving carbon neutrality but 2030. Without a larger effort the program will be unable to reach beyond low-hanging fruit to affect the major policy changes needed to reach carbon neutrality. If funding can be found, the commission's co-chair hopes Clemson can create a position to serve as a focal point for their sustainability efforts.

(B. Sill, personal interview)

Organizational Structure for Clemson University



Timeline and Scores for Clemson University



University of New Hampshire

The University of New Hampshire has one of the highest ranked sustainability programs in the country. The Sustainable Endowments Institute has identified New Hampshire as an “Overall College Sustainability Leader” and a “Campus Sustainability Leader.” The recalculated green score for 2011 was a 3.8, the highest score received.

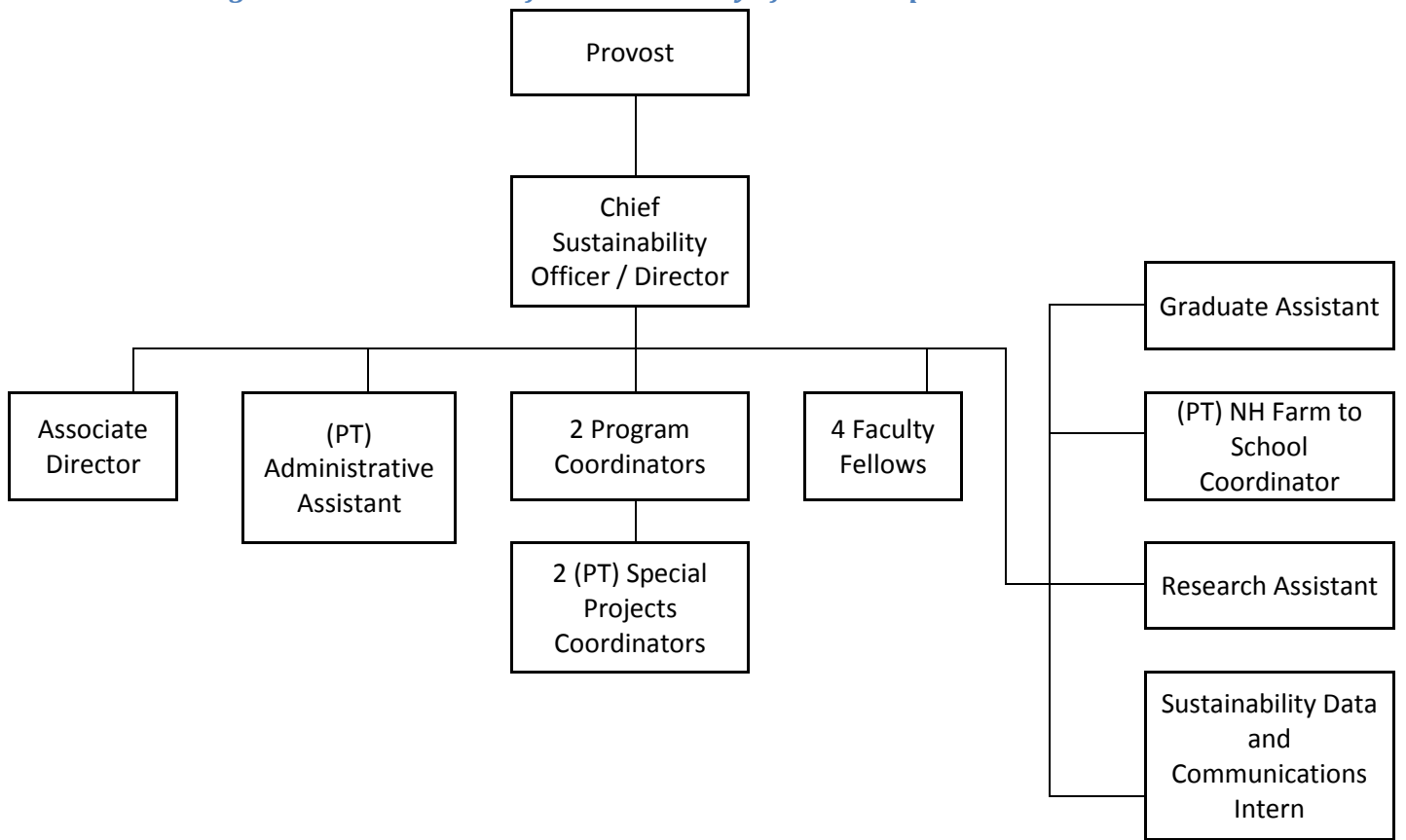
The University of New Hampshire’s program receives high levels of reliable funding through a specific sustainability endowment begun in 1997. An alumnus donated enough money to provide an endowment to create the original UNH Office of Sustainability. This office has evolved over the years to become the UNH Sustainability Academy. Now, the academy has a large office with four core full-time staff members, four part-time staff members, four faculty fellow, and a range of student positions.

Over time, sustainability has become a core value at the University of New Hampshire. The program received early grassroots support from students, faculty, and staff. This bottom-up initiation received a positive response from the upper administration and when there was an opportunity to create an endowment for the Office of Sustainability they did. The university has supported this model “to integrate sustainability into our mission and identity and to help us cultivate a critical and creative global sustainability outlook into our students and ourselves” (Cleaves, et al. 241).

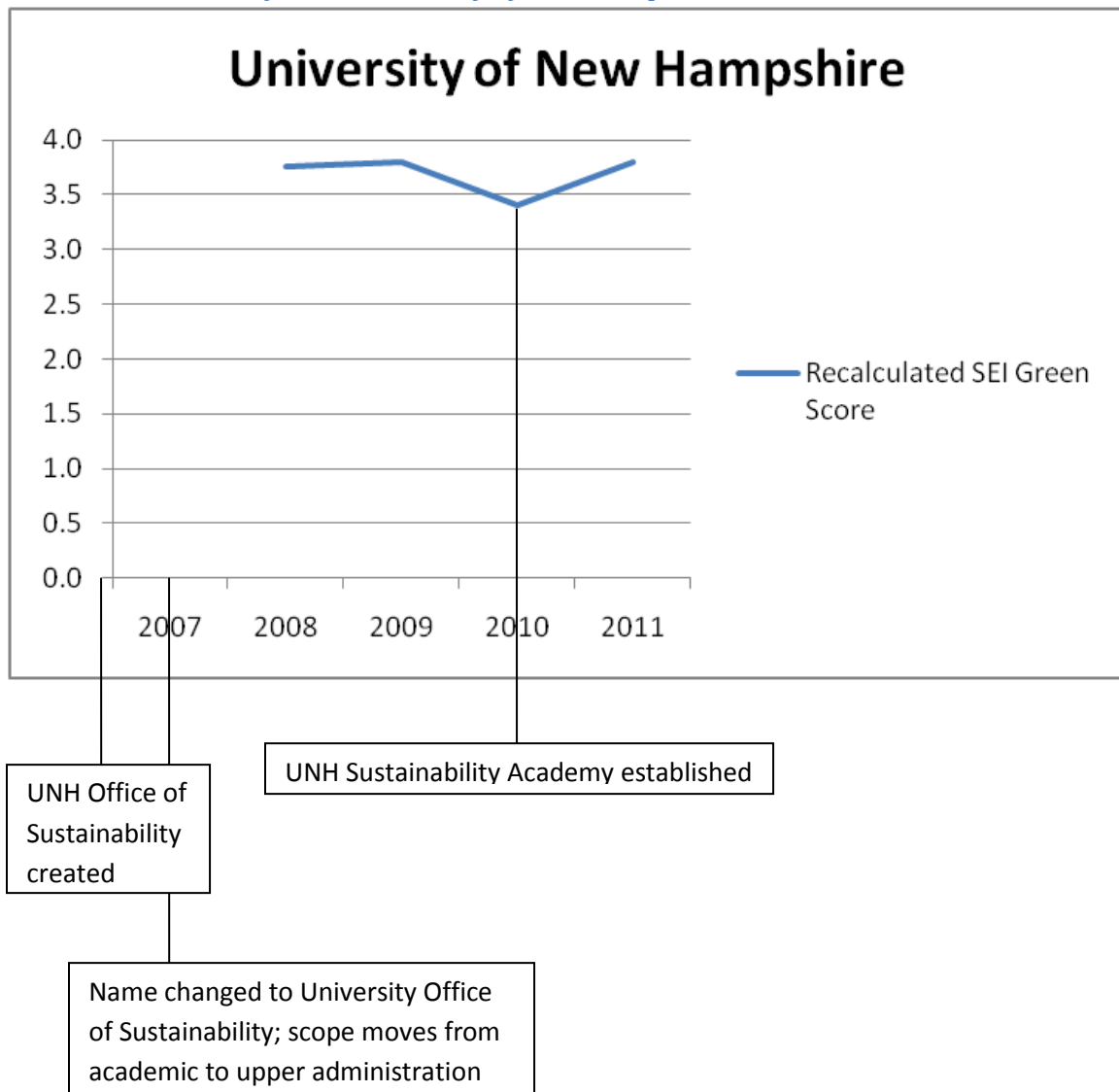
The program’s scope has expanded with the office’s funding and size. The scope was initially based in academics and the director reported to an academic dean. In 2007, the director became New Hampshire’s Chief Sustainability Officer and began reporting to both the Provost and the Executive Vice President. While the scope does not appear significant through quantitative analysis, at the University of New Hampshire it has been important to adapt it over time to the program’s needs.

Having reached a score of 3.8 out of 4.0 in 2007, New Hampshire has not yet improved its program beyond that level. The campus changes that could accomplish large improvements with low resources would have been made long ago, and each step the university takes now will require greater effort and investment. Expanding to the Sustainability Academy model in 2010 was one means of meeting this greater demand. Another option under consideration is the formation of four task forces into a presidential “Sustainability Executive Council.” The University of New Hampshire has reached an interesting point in the institutionalization of sustainability. They have achieved high levels of success with high funding, a large office, and campus-wide support; now the university needs to identify which variables still have room for improvement if they are to further increase sustainability on campus.

Organizational Structure for the University of New Hampshire



Timeline and Scores for the University of New Hampshire



Rutgers University

Rutgers University has a sustainability-focused position, and its scope is based in the Facilities Services side of campus. The university has received one of the lowest recalculated green scores, with a 3.0 in 2011, and its rate of improvement is among the lowest as well.

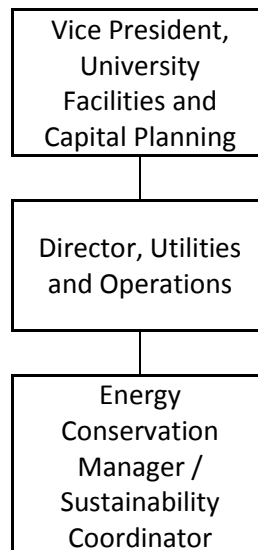
Rutgers has a long, fluctuating history of sustainability initiatives. There was an early committee in the beginning of the 1990s that tapped grassroots support to form a bottom-up coalition. When the group accomplished its main goals of increasing sustainability in Rutgers' purchasing practices and installing a cogeneration plant on campus, the volunteers disbanded. The effort was reborn in 2005 when the Rutgers Sustainability Committee formed again. The primary support came from students, faculty, and staff, but the president was the person who actually created the committee and charged them with producing a sustainability report. Before the sustainability report was completed, though, the president was replaced and the new president

did not have expectations for the sustainability committee. It was not until 2009 that the campus acted on committee's recommendation for a full-time staff member. When this position was created, the role of Sustainability Coordinator was added to the Energy Manager position. The committee's involvement tapered off with the creation of the Sustainability Coordinator so the program rests entirely on that position. Considering the results from the quantitative analysis, it should be no surprise that a one-person staff with no sustainability-specific funding or space could only achieve low green scores relative to campuses with more developed programs.

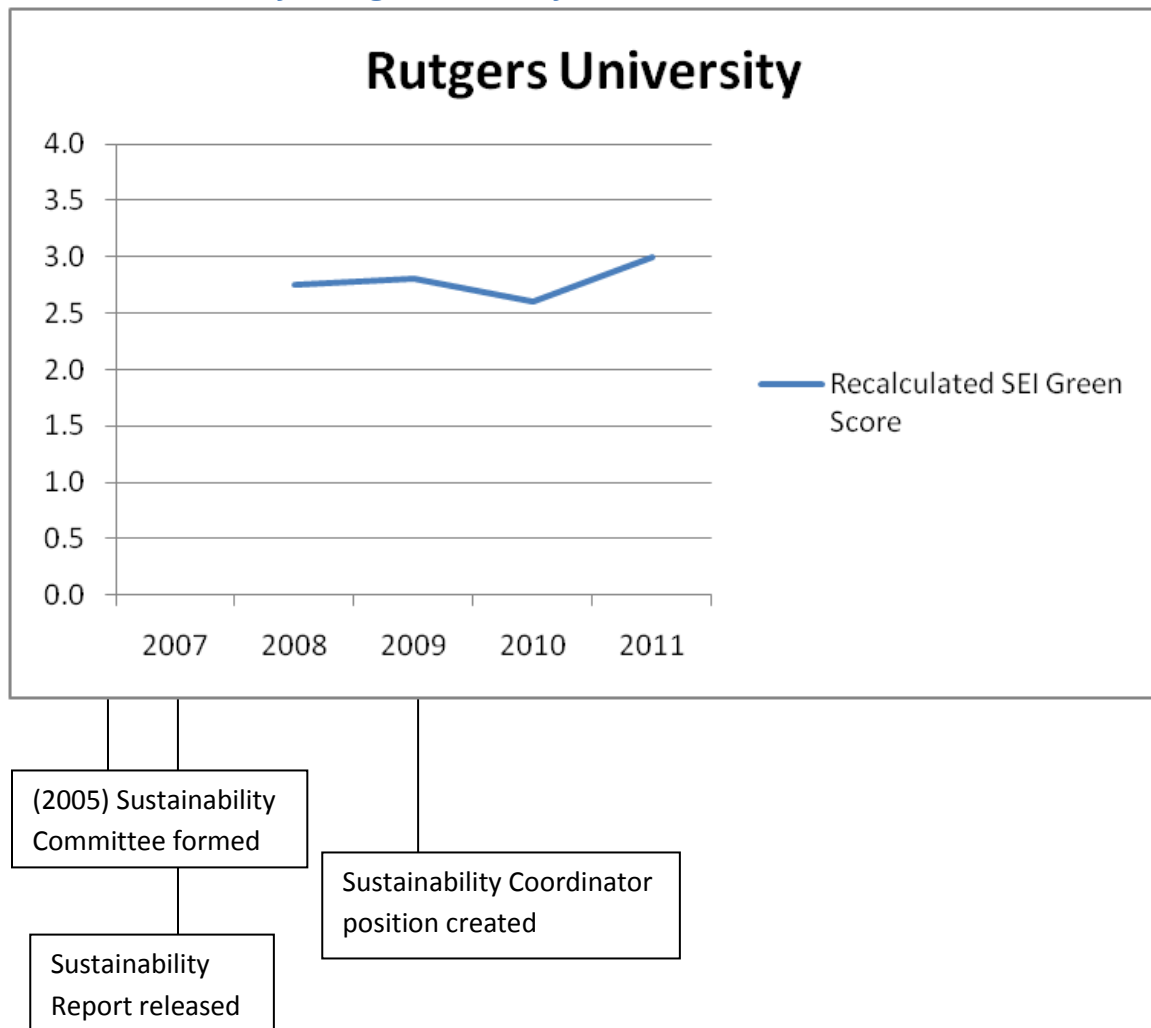
When the committee was responsible for sustainability efforts, "lacking a staff person was a major barrier." Today, Rutgers has a staff person but the program still has no budget and relies on funding through units like Facilities for campus projects. Faculty and student involvement have room to increase but with a facilities-level scope the Sustainability Coordinator has few opportunities to work on individual level behaviors and involvement. The position has yet to develop any campus-wide sustainability plans, which could improve campus sustainability when in place.

(C. Andrews and M. Kornitas, personal interviews)

Organizational Structure for Rutgers University



Timeline and Scores for Rutgers University



Virginia Military Institute

Of my eight case studies, Virginia Military Institute had the lowest recalculated green score. In 2011, the campus received a 1.4 for their sustainability efforts.

The school does not have an official sustainability program or campus-wide initiative. An energy manager is the position most responsible for sustainability initiatives in general, but the focus is clearly on energy efficiency. There is also an unofficial committee of volunteers, but they have no authority or responsibility even.

There is no budget for sustainability projects or programming. The energy manager can ask for funding through the physical plant budget, but he must make the case for sustainability-motivated projects individually. He is looking for fixed funding for energy efficiency work but has not found it yet.

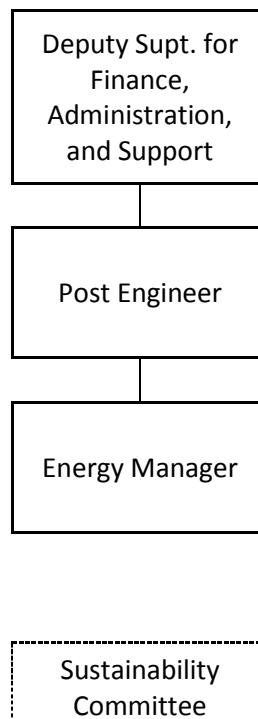
Relating Virginia Military Institute to the components of the quantitative analysis, this case follows what was identified as significant in the first principle component. The program has very

little funding and it is entirely unreliable since it is sought on a project-by-project basis. The work that is done for sustainability is left to one position that is meant to focus only on energy use.

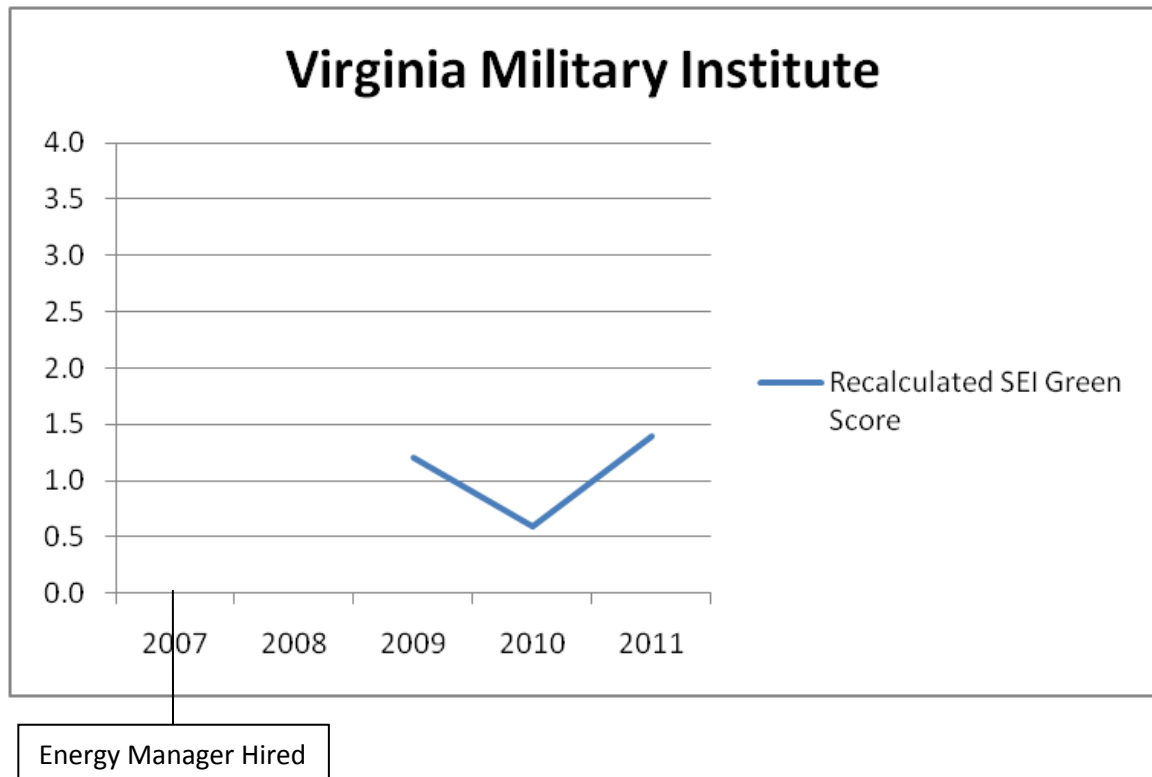
There is some campus-wide support for the sustainability program, but the campus lacks a grassroots campaign or push for the initiation of a broader sustainability program. Virginia Military Institute somewhat typifies the conception of a small school with strongly top-down initiation of their program, especially since the energy manager position was created because of a policy passed within the state legislature. This structure has resulted in a relatively unsuccessful program, as the analysis would suggest.

(T. Pegg, personal interview)

Organizational Structure for Virginia Military Institute



Timeline and Scores for Virginia Military Institute



Virginia Polytechnic Institute and State University (Virginia Tech)

Virginia Tech is another institution with a steady increase in its recalculated green score over time, going from a 2.3 in 2008 to a 3.8 in 2011. They have an expansive sustainability program. Their structure is a large office based in the Facilities Services department, as well as sustainability staff in Housing and Dining Services. There is also an official committee focused on energy and sustainability. The size of the program brings an important diversity of perspectives and skills to Virginia Tech's sustainability efforts. As the sustainability coordinator noted, the program is far too large for one person to manage everything and having a team of people dedicated to sustainability has made the institution's accomplishments possible.

The Office of Energy and Sustainability serves as a focal point for the program and houses three full-time staff members. The program receives moderate funding, with an operational budget for the office provided through the university's general fund and the potential to fund projects through other campus departments. This large size and high level of funding correlate to Virginia Tech's high recalculated green score, as suggested by the quantitative analysis.

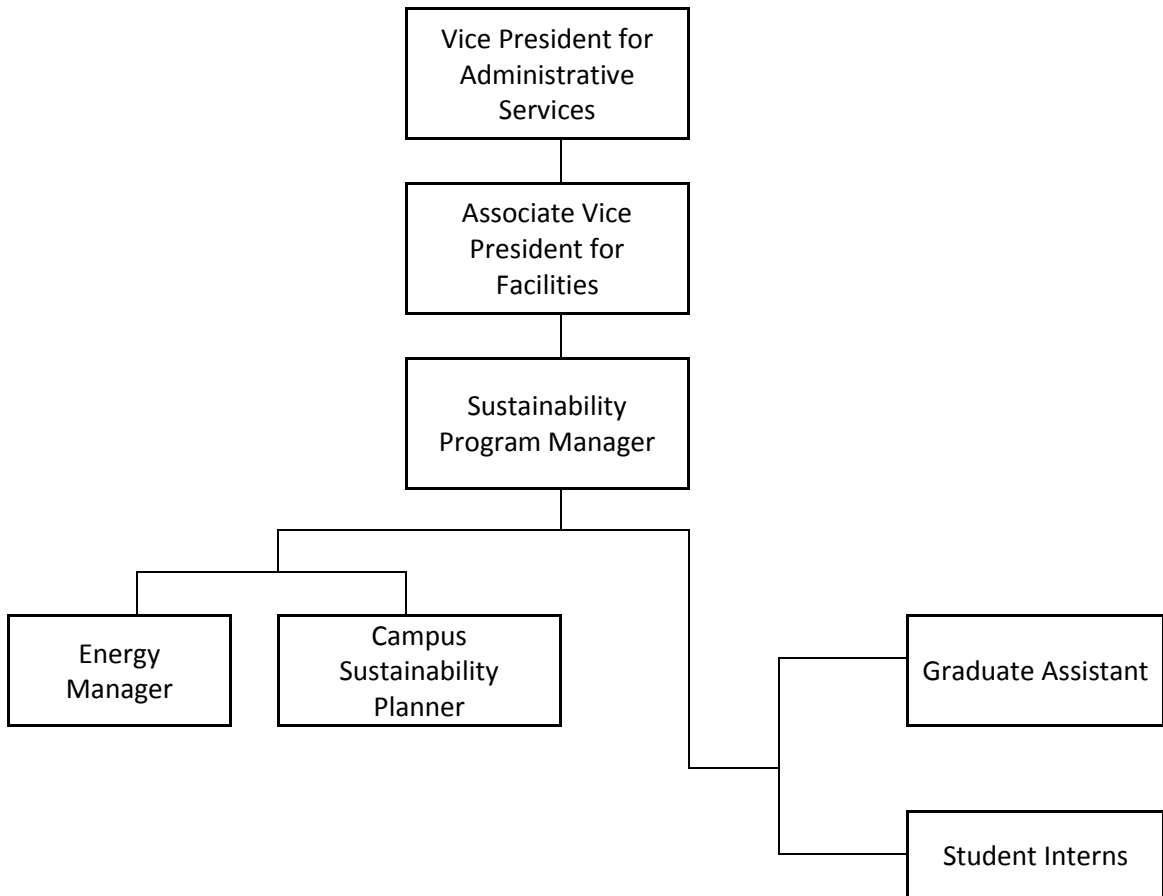
The program came into existence largely due to the efforts of students, but they succeeded only because of the positive response they received from the administration. The creation of the original committee and then office was possible because of the groundswell of support seen across campus. To institutionalize this support, Virginia Tech entrusted the office's Sustainability

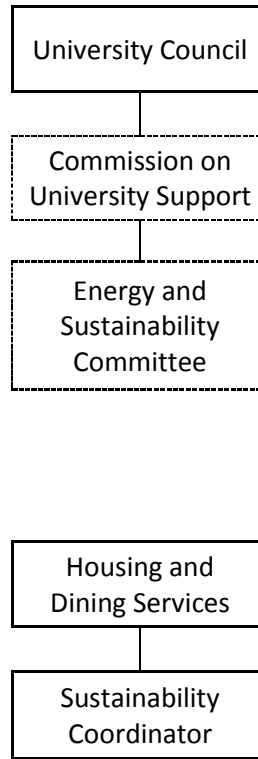
Plan, with a carbon action plan included. The campus' large student population also provides a larger base to draw on for support and volunteers.

Also as suggested by the quantitative analysis, the scope of the sustainability program did not have a limiting or negative effect on Virginia Tech's outcomes. The office is based within Facilities Services, but its impact extends much farther than campus operations.

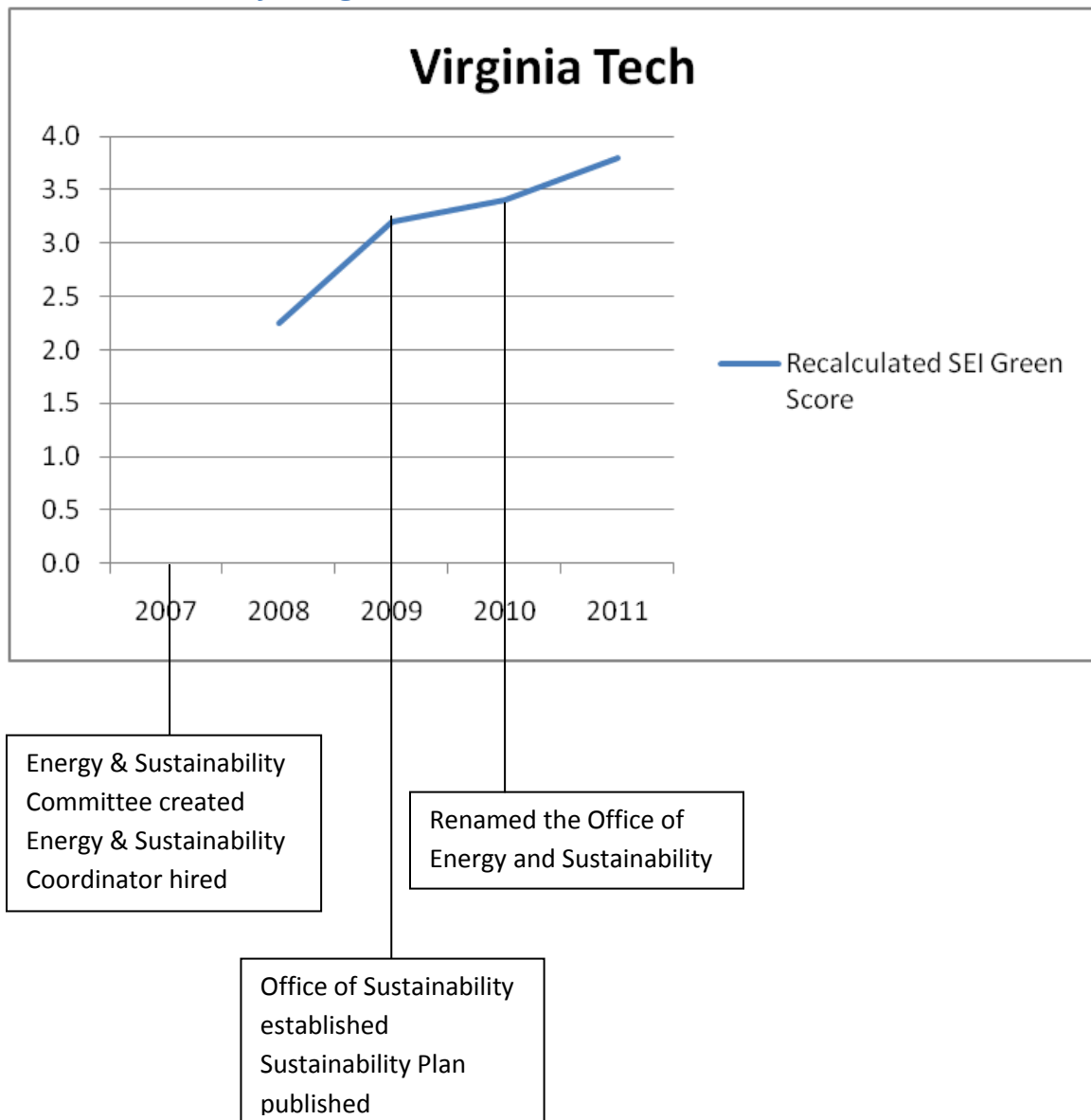
(D. Cochrane, personal interview)

Organizational Structure for Virginia Tech





Timeline and Scores for Virginia Tech



Wake Forest University

Wake Forest University has a small office with a broad scope; the director reports to both a senior administrator and the provost. Her focus as director has also been to empower other campus representatives to take on sustainability as their responsibility, rather than concentrating the mission within her office. This effort has led to a steady and substantial increase in Wake Forest's recalculated green score. The institution went from a 1.0 in 2007 to a 3.4 in 2011.

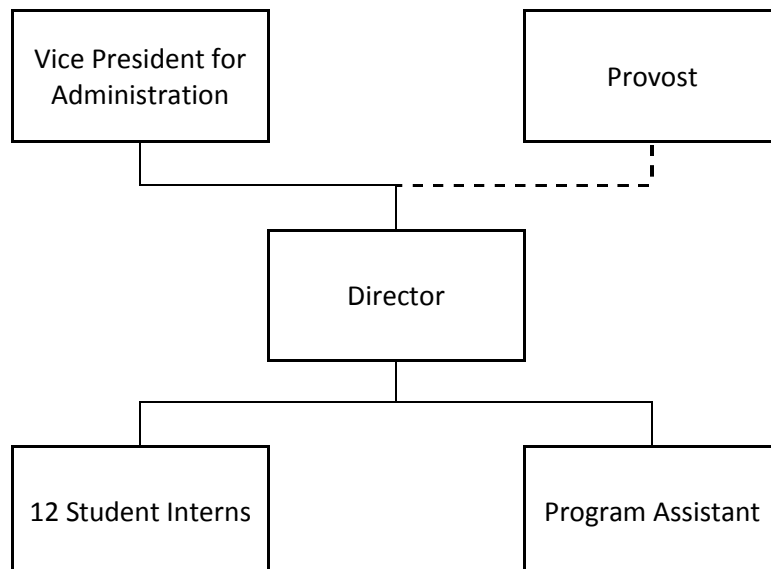
In terms of funding, the sustainability program at Wake Forest is moderately well supported. The office has a budget for operating expenses, though it must seek funding elsewhere for projects. It is a small office. There is a director, a recently hired administrative assistant, and twelve student interns. This has begun to coordinate with the new Wake Forest Center for

Energy, Environment, and Sustainability and the two share a space. This dedicated space allows the two units to host outreach events and to become a physical focal point for sustainability on campus.

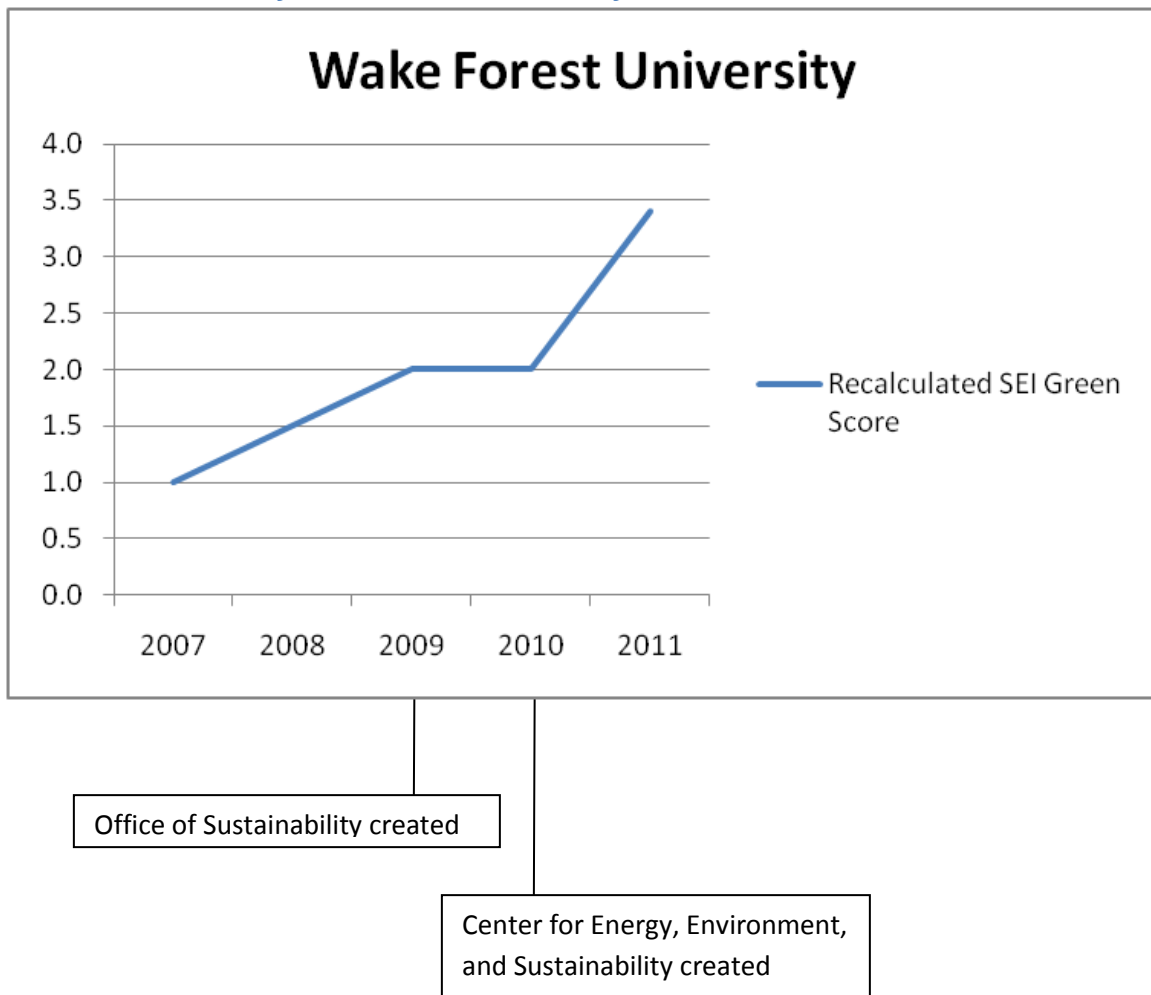
Before the office was created, there was unguided support for sustainability efforts across campus. The senior administration created the office and the director position in order to better coordinate these disparate efforts. Because of this existing interest, the director has been able to function as a resource rather than a messenger for sustainability. In the first year of the office, the focus was on building relationships and networks to support campus sustainability efforts. Now that formal support is in place, the hope for next year is to use this broad community to develop a sustainability plan for the campus.

(D. Johnson, personal interview)

Organizational Structure for Wake Forest University



Timeline and Scores for Wake Forest University



The College of William and Mary

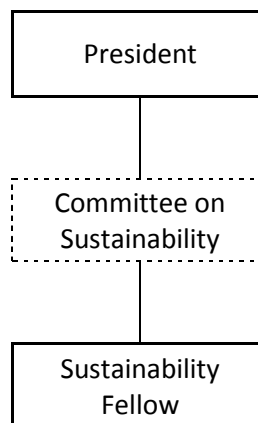
The William and Mary model has its scope set at the level of the senior administration. The structure includes both a committee and a sustainability-focused position, the Sustainability Fellow. Over four years, William and Mary has seen the greatest improvement in its score of all the schools studied. The institution was the lowest scoring in 2008 (although Virginia Military Institute did not receive a score that year) with a 1.0 and has risen to a 3.4 in 2011, securely within the second tier of schools.

William and Mary's early success seems unpredictable by the variables highlighted in the quantitative analysis. The program receives a minimal amount of operational funding to support the one staff position; this money comes through the school's general operating budget and the fellow's salary has come from private donations in the past so the institutional funding is fairly unreliable. The sustainability staff is very small and the program has relied heavily on volunteers for the progress it has made. With only one staff member, there is no dedicated space on campus for sustainability; the sustainability fellow has a small office but no public space for outreach or education.

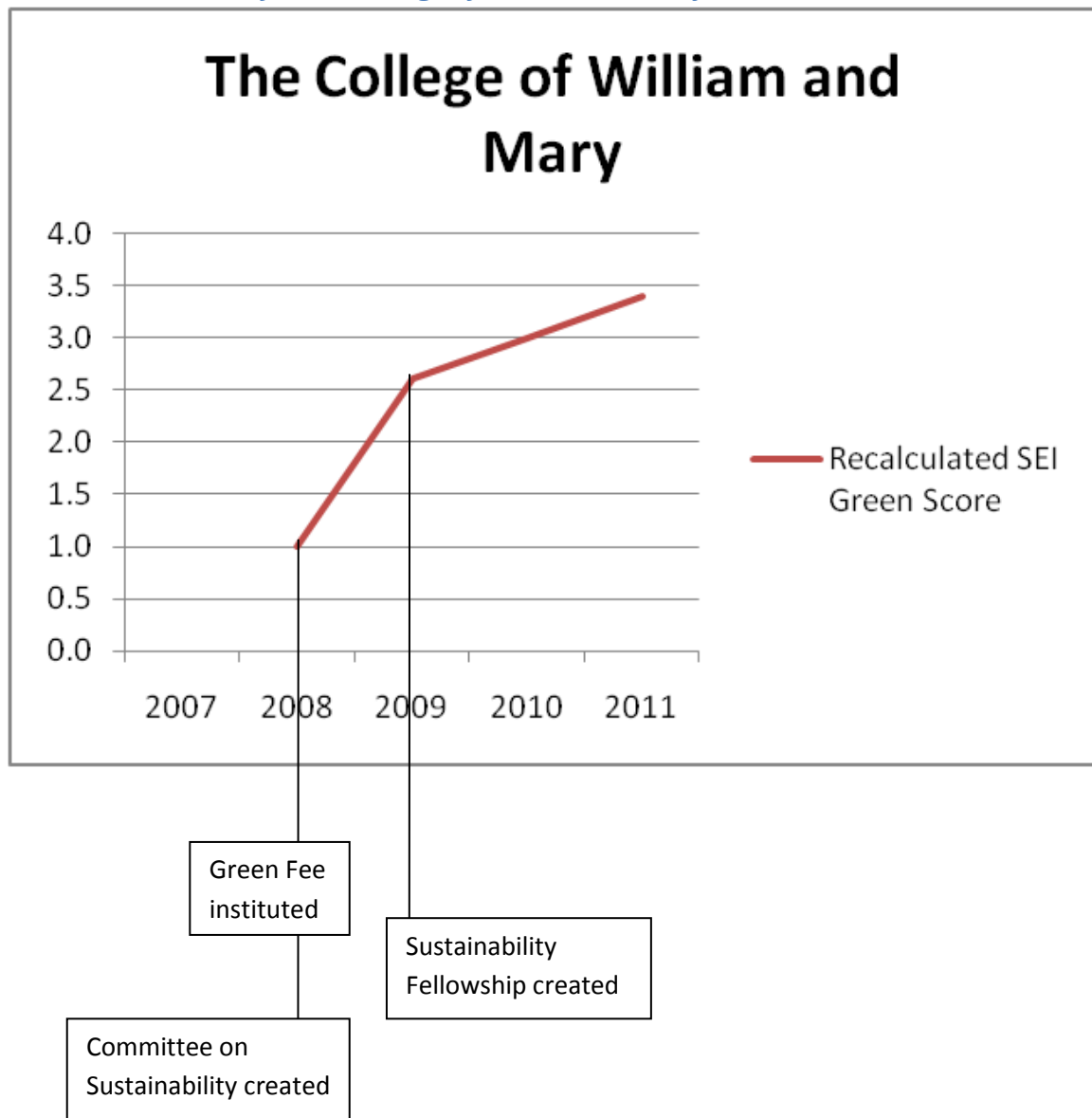
There has been a strong bottom-up initiative for sustainability at William and Mary. Students have been a major force, along with faculty and staff members. In 2008, students chose to establish a student fee that funds campus-based projects, student research, and contributes to a green endowment for future projects. It was this fee that spurred the creation of the Committee on Sustainability to meet the need of someone to manage the fund. After one year of existence the committee encouraged the creation of the Sustainability Fellowship to provide greater oversight to sustainability efforts and to serve as a greater resource for campus-wide efforts. For its first two years, as mentioned above, the fellowship was funded by a private donor but the committee hopes to make the fellowship a permanently funded position through William and Mary in the future.

(S. Hanke, personal interview)

Organizational Structure for The College of William and Mary



Timeline and Scores for The College of William and Mary



Synthesis of Qualitative and Quantitative Results

The findings of the qualitative results were compared to the quantitative findings to explore which schools best fit the model and supported the findings.

The following charts show the variables in which an individual school supported the quantitative findings (+), contradicted the quantitative findings (-), or was unrelated to the quantitative findings (0), as seen through the qualitative analysis. Each chart appears by principle component.

Table 1: Qualitative Support of Principle Component 1

School	Funding Amount	Funding Reliability	Size	Space	Bottom-up Initiation
Brandeis	+	0	0	0	+
Clemson	+	+	+	0	-
New Hampshire	+	+	+	+	+
Rutgers	+	+	+	+	0
VMI	+	+	+	+	+
Virginia Tech	+	+	+	+	+
Wake Forest	+	+	+	+	0
William and Mary	-	-	-	-	+

Overall, the qualitative data supports the quantitative analysis. William and Mary was the only school to repeatedly serve as the exception to the rule.

Table 2: Qualitative Support of Principle Component 2

School	Faculty Involvement	Planning Documents
Brandeis	0	0
Clemson	+	+
New Hampshire	+	0
Rutgers	0	0
VMI	+	+
Virginia Tech	0	+
Wake Forest	0	0
William and Mary	+	+

For principle component 2, the information presented in the qualitative analysis also agrees with the model suggested by the quantitative analysis. Not every school obviously exhibited these variables, but if they did the variables correlated to the expected outcomes.

Table 3: Qualitative Support of Principle Component 3

School	Enrollment	Bottom-up Initiation	Top-down Initiation
Brandeis	0	+	0
Clemson	0	+	+
New Hampshire	0	+	0
Rutgers	0	0	0
VMI	0	+	+
Virginia Tech	+	+	0
Wake Forest	0	0	0
William and Mary	0	+	0

The qualitative data also supports the correlations represented in principle component 3. At each school where the variable had a sizeable impact, the outcome was as you would expect from the quantitative analysis.

Table 4: Qualitative Support of Variables Unimportant in the Principle Component Analysis

School	Scope	Age	Participation in PCC
Brandeis	-	0	-

Clemson	0	0	-
New Hampshire	-	0	0
Rutgers	0	0	0
VMI	0	0	0
Virginia Tech	0	0	0
Wake Forest	0	0	0
William and Mary	0	0	0

While these variables did not correlate to outcomes as considered by the principle components analysis and regression analysis, the qualitative data suggests that some at least should not be ignored. The scope of a program did play a role in the outcomes at two schools according to the quantitative analysis; the same is true of a school's participation in the President's Climate Commitment.

Discussion

The quantitative analysis was able to identify which variables had the strongest correlations to outcomes in campus sustainability programs, but the qualitative analysis was able to identify which specific schools supported these correlations or which schools were exceptions to the rule. It is the exceptions that I find most interesting, because these institutions demonstrate that context matters. As the most notable exception, The College of William and Mary has seen a surprising level of success considering that its low funding, small program size, and the lack of a dedicated space would all suggest a much less effective program. The program's success has relied heavily on bottom-up initiation and grassroots support. Taking a larger perspective of the eight case studies, though, does highlight which variables are most influential overall.

The most effective institutional structure for campus sustainability would exhibit five characteristics: high levels of funding, reliable funding, a large program size, a dedicated physical space, and a bottom-up initiation. This requires that a college or university make a significant investment if its sustainability program is to thrive.

In my interviews, perhaps not surprisingly, funding was often cited as the limiting factor for sustainability programs. The economic downturn has made the creation or expansion of programs like sustainability particularly challenging. Little money is available for high levels of funding for sustainability programs, and in an uncertain economic environment it is difficult for schools to commit to reliable funding at any level. But this is ultimately one of the most significant variables in a program's outcome. In some ways, times of financial constraint are the best opportunity to begin an office; sustainability is largely about increasing efficiency and doing more with fewer resources (Simmons and Moody 2010). Making a commitment to sustainability funding can be the most important step an institution takes, and it will improve the sustainability program as well as the entire campus.

The number of personnel permanently associated with a program is a major determinant of the capacity of a sustainability program. Programs with a large staff will have a greater ability to address complex sustainability challenges and to implement wide-ranging policies. The potential

for division of labor within the staff can also make a program more efficient. With only a small staff or a volunteer committee, the same few people will be left overseeing programs, implementing specific initiatives, administering any budget they have, as well as numerous other tasks.

A dedicated space for the sustainability program gives a physical center for the campus' efforts and also serves as a tangible display of the school's commitment to sustainability. Schools with a physical office space or public area dedicated to sustainability are able to use that location to host programming that supports their sustainability goals. In institutions where the sustainability program does not have a specific, permanent location or where the space is limited to an individual office, the broader campus can have difficulties engaging the program.

Bottom-up initiation is a strong factor in a program's success and shows the campus-wide support for the program. The grassroots effort for creating or expanding a sustainability program must be met with a positive response from the administration in order to create an official sustainability program, but the real significance rests on the grassroots efforts. In only two schools did the administration begin a sustainability program without inspiration from the campus community, and neither program was among the highest scoring. Though the correlation was weaker, top-down initiation did have a significant relationship with lower scoring sustainability programs. This emphasizes the strong need for broad support and investment in the program rather than policies imposed from the upper administration.

Planning documents had an interesting effect on outcomes; they correlated with more effective sustainability programs overall, but they also were linked to slower improvements over time. This may indicate that sustainability plans or carbon action plans exist in a mutually exclusive relationship with actual projects and programming, at least during the initial phases of a program. Multiple schools interviewed articulated this decision, saying they had spent the early years of the program crafting plans without taking much action.

Some characteristics of programs had no significant impacts on the outcome. The defined scope of a program did not appear to influence the outcomes of the program. Brandeis University and University of New Hampshire both found the scope allowed to their sustainability programs affected the outcomes. Brandeis University experienced limitations due to its scope; while the University of New Hampshire had found it necessary to revise the scope of its program in order to have the most successful outcomes.

A program's age was unrelated to its recalculated sustainability score; relatively new sustainability programs apparently have no trouble catching up to their more established peers. Perhaps this is not surprising, given the relative youth of the majority of sustainability programs that I studied.

In the end, the most successful programs are found on campuses where both the institution and the grassroots have made a strong commitment to sustainability, investing money, time, and

labor in the program. This institutional support is crucial for enacting effective sustainability initiatives.

Recommendations for the College of William and Mary

A key motivation for my research was to develop feasible, sustainable suggestions for The College of William and Mary's sustainability program. I wanted my research to have a concrete application from the start. These recommendations should also serve as an example as to how this research could apply to other institutions.

Funding is a key factor that The College of William and Mary needs to improve upon as its sustainability program develops. The program would benefit from a larger investment of funding, providing for greater outputs and maintenance of current projects. The funding for the program also needs to become more reliable. Presently, the only staff position is supported by private donations that are not guaranteed from year to year. The program's current operations and maintenance rely on the general operating budget, which has recently been subject to deep budget cuts and increased demands. The College does have a sustainability fund through a student fee, but this is only sufficient to fund a limited number of research and pilot projects every year and does not offer continuous funding for most initiatives. Without a larger dedicated fund or endowment for sustainability initiatives, William and Mary's sustainability program may be limited from achieving future success.

Making a greater investment in the program requires greater amounts of funding originally, but it will save the institution money in the long-run. Since its creation, the Committee on Sustainability has saved more than \$100,000 by investing in sustainability projects, many of which will have continuing returns every year. The investments in cost-saving, efficiency initiatives will repay themselves as accelerated savings and cost reductions in the future.

A chief use of increased resources would be to increase the size of the program. With only one staff member dedicated to sustainability, the program at William and Mary is highly dependent on volunteers. Greater administrative support would make the program more effective; other staff members, or paid student staff, would bring greater experience and capacity to the program. Additional staff members could also reinvigorate the volunteer base and provide greater support in order to generate greater involvement. Grassroots support has proved crucial to sustainability programs' success, and at The College the originally high grassroots support has declined over time. Expanding the size of the program staff would offer greater institutional support for the development and implementation of projects, and offer greater guidance to students in particular.

Lastly, a dedicated space for the sustainability program would better support the program. Schools with office spaces that have a public area are able to host outreach and educational events within those spaces. Having a physical presence on campus can serve as a focal point for sustainability. The office would provide a base from which to network with other programs around campus in order to collaborate on shared goals. An easily identifiable space is important

not only for the campus community, but also for opportunities to outreach to the local community. For William and Mary, a recognized leader in engaged learning, having a suitable meeting space from which to stage discussions and form partnerships for community outreach would be a beneficial investment.

The College of William and Mary has already shown a strong bottom-up initiation of its campus sustainability program. The administration should ensure that they support this effort and encourage continued involvement from students, faculty, and staff. For those involved in the grassroots efforts to establish an effective sustainability program, the recommendation is to keep working toward that goal, knowing that their involvement will be a key factor in the success of the program.

These four areas should see the greatest attention from William and Mary as its sustainability program develops. They should have the greatest impact on the College's sustainability performance overall.

Broader Implications

Beyond William and Mary, other institutions of higher education can use the variables I have identified to determine the areas in which they should focus their efforts to improve their campus sustainability programs. Colleges and universities need to ensure that they are using their limited resources as effectively as possible.

If colleges and universities decide to seriously take up sustainability goals, they will also need to make serious investments in their sustainability programs. This research should emphasize the fact that schools cannot create meager sustainability programs and expect lucrative results.

For the field of campus sustainability research, I would hope that my work contributes to the broader understanding of sustainability on campuses and the potential for future work in this field.

Potential for Future Research

My research has strong potential to form the foundation for future research. Now that the variables characterizing campus sustainability programs have been identified, future research should evaluate this model on a broader scale. My case studies provided an opportunity to analyze programs in detail, but a wider survey of institutions of higher education would be the best next step in determining the most effective campus sustainability structures.

The variables identified could also be studied in greater detail. Funding, in particular, is a broad characteristic and institutions higher education could benefit from better understanding the relationship between finances and sustainability programs. My distinction of funding amounts and funding reliability is a start, but future research could consider what specific items receive funding through sustainability programs, or how programs are able to fund projects outside of their regular budget.

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Appendix I: Interview Questions

1. When did your campus' sustainability program begin?
2. What was the motivation for starting the program?
3. Who were the primary campus supporters of this program?
 - a. Were there any obstacles to creating the program?
4. Where is your program placed within the institutional structure of your school?
5. How is the program structured overall?
6. What positions are included in the sustainability program?
7. How many of these are staff positions? (full-time? part-time?)
8. How many of the positions are volunteer or students receiving academic credit?
9. What were the start-up costs of the program?
10. What is the ongoing operational budget?
11. What are the funding sources for the program?
12. Are there plans to modify this program in the future?
13. What have been 1-3 of your most successful initiatives?
14. What have been 1-3 of your less successful initiatives?
15. Why do you think the campus sustainability program as whole has been successful / unsuccessful?

Appendix II: Ordinal Scales for Variable Measurement

Endowment – numerical

Public / Private

- (0) Public
- (1) Private

Enrollment – numerical

Staff Involvement

- (0) No staff involvement
- (1) Informal staff involvement
- (2) Formal volunteer staff positions
- (3) Sustainability staff positions

Faculty Involvement

- (0) No faculty involvement
- (1) Informal volunteer faculty positions
- (2) Formal volunteer faculty positions
- (3) Sustainability faculty positions

Student Involvement

- (0) No student involvement
- (1) Student involvement, student groups exist
- (2) Academic credit for positions
- (3) Paid student positions

Funding, Relative Amount

- (0) No budget
- (1)
- (2) Budget for operations costs
- (3)
- (4) Budget for projects and programming

Funding, Source Reliability

- (0) No budget
- (1) Grants, rebates, etc fund sustainability program
- (2) Institution's general operating budget designates money for sustainability
- (3) Sustainability-specific endowment

Student fee

- (0) No
- (1) Yes

Top-down Initiation

- (0) No support from senior administration, or administration was an obstacle
- (1)
- (2) Senior administration answered demands from bottom-up
- (3)
- (4) President or senior administration made the decision unasked

Bottom-up Initiation

- (0) No support from students, faculty, or staff, or they were an obstacle
- (1)
- (2) Accepted decision and implemented sustainability goals
- (3)
- (4) Driven by students, faculty, & staff at the grassroots

Physical Space

- (0) No physical space
- (1) Office space for staff integrated into another department
- (2) Specific sustainability office space with public gathering area

Scope

- (0) None
- (1) Facilities
- (2) Academic
- (3) Senior Administration

Program Size

- (0) Committee only
- (1) One position
- (2) Small office – one person with a sustainability-focused job and administrative support
- (3) Large office – multiple people with sustainability-focused jobs

Age – numerical, years since the creation of an official sustainability structure

AASHE Member

- (0) No
- (1) Yes

STARS Participant

- (0) No
- (1) Yes

PCC Signatory

- (0) No
- (1) Yes

Climate Action Plan

(0) No

(1) Yes

Sustainability Action Plan

(0) No

(1) Yes